RAILROAD GAZETTE

FRIDAY, NOVEMBER 27, 1896.

CONTENTS

Contributions.

Train Signals on the Reading in 1850.

Lehigh Valley Railroad,
SOUTH PLAINFIELD, N. J., Nov. 20, 1896.

TO THE EDITOR OF THE RAILROAD GAZETTE:

In connection with your editorial in the issue of Nov. 13, discussing a proposition "to carry green signals on the *last* section of a train, instead of on all sections except the last," it is of interest to note that the idea of carrying the signals on the last section is not new, but a revival of one used years ago.

About 1850, when the Philadelphia & Reading was a single-track road, when the telegraphic train order was unknown, when each crew had "a curve runner" and when trains were run in convoys, it was the rule on the Philadelphia & Reading for the last of the convoy, or as we should say, the last section, to carry a large white ball on the pilot to indicate that opposing trains could proceed.

My informant, at that time a boy on the line of that road and now an active Division Superintendent, fully agrees with your final recommendation: use the block system and thus render obsolete many rules and signals.

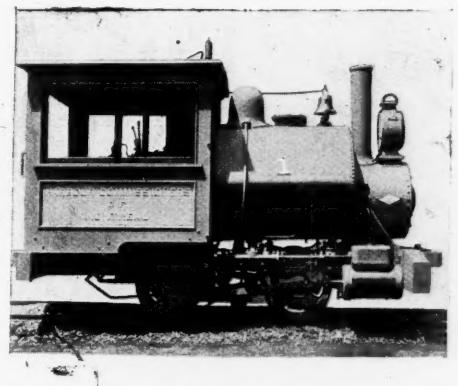
L. E. MOLINEUX.

Locomotive Building in Canada.

Canadian Locomotive & Engine Co., Limited,
KINGSTON, Ont., Nov. 16, 1896.

TO THE EDITOR OF THE RAILROAD GAZETTE:

In your issue of Nov. 13, describing a small locomotive made at Thetford mines, Quebec, you say that it



Dimensions of Saddle-Tank Locomotive.

Cylinders, 8 in. diameter by 14-in. stroke.
Driving wheels, 28 in. diameter outside tires.
Tank 200 imperial gallons, equal to 240 U. S. gallons.
Wheel base, 4 ft. 9 in.
Weight, about 20,000 lbs. in working order.
Boiler working pressure, 140 lbs. per square inch.
Load—Cars and lading at 10 miles per hour.

On level	about	467 tons.
" 20-ft. grade	"	214 "
" 50-ft. "	"	115 "
"100-ft "	"	62 "

" was made at the works in Thetford, as a matter of economy, as the cost of a Porter or Baldwin locomotive of the same size, with the tariff duty of 35 per cent., would have cost in the neighborhood of $4,500."

This would imply that such an engine could not be obtained of Canadian manufacture.

I enclose photograph and description of a small locomotive built by this company, which would have cost less than $3,000 delivered at Thetford, while it weighs 33⅓ per cent. more than the "home-made" engine made at Thetford.

We have built a large number of these engines, among our customers being firms from your side of the border working on Canadian contracts.

J. F. LEIGH, *Superintendent.*

Some English Railroad Matters.

Reduced Rates for Agricultural Produce.—I have more than once spoken of the extraordinary low rates introduced by the Great Eastern Railway Company for agricultural produce in retail quantities and the efforts the company has made to bring its new departure to the knowledge of all concerned either as producers or consumers. Now it is announced that no less than 160,000 copies of the list of farmers and others, about 900 in number, who are ready to supply produce to the consumer direct, have been printed and circulated in London. As a result about 5,000 boxes are being sent per month to London, while farmers and market gardeners have found themselves quite unable to execute the orders that have poured in on them, and it is said that the wholesale buyers are already finding themselves unable to renew existing contracts for farm and dairy produce except at an advanced price.

The company has gone farther, and, finding the demand for poultry and eggs from its district to be so largely in excess of the supply, has circulated broadcast a practical pamphlet on poultry-keeping, explaining the methods to be adopted and the profits that may reasonably be expected.

One other point is interesting. The Great Eastern originally restricted its new rates to non-competitive stations. Naturally the inhabitants of the excepted districts complained, the Board of Trade took the matter up with the other companies concerned, the Midland and the Great Northern, with the result that from Oct. 1 the reduced rates were extended to Great Eastern stations served by these companies also. Whether these companies in turn will be pressed to extend the same reductions to the remainder of their respective districts remains to be seen. If so it will not be long before the fire lighted by the Great Eastern will extend over the whole country, more especially as the Great Eastern is said to be contemplating the introduction of similar reduced rates for traffic to other great towns besides London.

The Thousand-Mile Tickets introduced by the North Eastern are proving popular and selling in considerable numbers. As I see the regulations for their use criticised in railroad papers, both of the Continent and of America, on the ground that the coupons are not directly available, but have to be exchanged at the booking office for ordinary tickets, it is perhaps worth while to point out, not only that this system obviates one of the strongest objections taken by American railroad officials to these tickets, namely, the risk of collusion between passenger and conductor to under-estimate the distance actually traveled, but, further, that with our English arrangements no other system was practically possible. There is no official in England corresponding to the Continentsl or American conductor. Our guards, who travel with the trains, have nothing to do with the control of tickets, which is entirely in the hands of collectors permanently attached to the different stations. Passengers, as a rule, travel unquestioned without showing their tickets from the departure station to their destination. Presumably no one would propose to trust to the honor of a passenger traveling with a mileage book in his pocket to state accurately at the arrival station his point of departure; presumably also fellow-passengers at the exit would not care to wait while the ticket collector looked up on the table of distances the exact mileage of the specified journey and then tore off the corresponding number of coupons; yet short of this it is difficult to see what could be done under English conditions other than to require the passenger to exchange his coupons for an ordinary ticket before commencing his journey. By the bye, I notice that the widely read and usually most accurate *Vereins Zeitung* gives the fare under this system as 2.5d. per mile or 13 pfennigs per kilometer, first-class. In fact, it is precisely one-half.

W. M. ACWORTH.

A Novel Lift-Bridge on the Erie.

The purpose of the Erie Railroad to build third and fourth tracks made necessary a new bridge over Berry's Creek, on the Hackensack Meadows, about seven miles out of Jersey City. The new structure consists of two fixed spans of deck plate girder, each 50 ft. over all, and a draw. The old draw spanned a clear opening of 22 ft. 6 in., while the clear span of the new one, between pile fenders, is 24 ft. The running tracks of the Erie are spaced 13 ft. center to center, and the total distance over the four tracks is about 44 ft. Obviously it was easier to lift the draw than to turn it.

The draw span in its normal position is a deck plate girder bridge, 32 ft. in length; when lifted it is a truss. It is framed as shown in Fig. 1. The stringers are connected to the header girders *X* and *Y*, and the bracing is such that, when the bridge is lifted to an upright position about the hinge joints at *A* and *B*, the girder *X* is the bottom chord of the truss *A B C D*. The structure is very stiff in this position, there being almost no deflection in girder *X*, although it is then on its flat side.

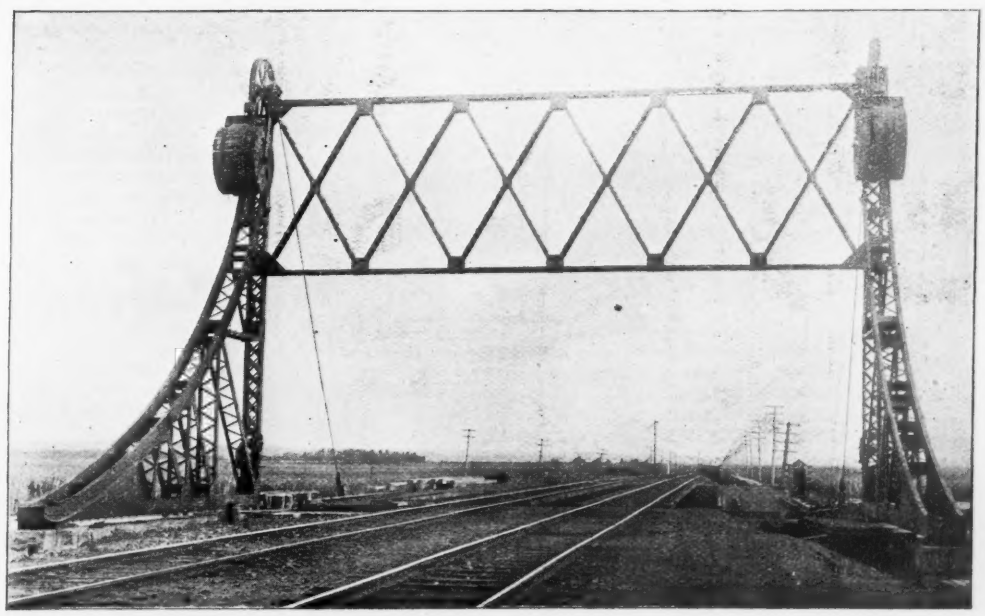


Fig. 10.—Lift Bridge over Berry's Creek on the Erie Railroad.

The struts *A D* and *B C*, performing the duties of end posts, consist of a ⅜-in. web plate and four 6-in. × 4-in. × ¾-in. angles, while *D E* and *C F* are riveted frames, entirely of angles, whose duty it is to resist the pull of the hoist and counterweight ropes which are attached at *E* and *F* to girder *Y*. The top chord of the truss *C D* is composed of crossframes made of a ⅜-in. plate and two 3-in. × 3-in. × ⅜-in. angles riveted to the longitudinal girders. A detailed plan, showing the lateral bracing, with elevations of the longitudinal girders and crossframes of the draw, is given in Fig. 2. The ends of all the stringers are faced for their connection to the header girders. Each tie is bolted to the stringer through open holes left in the top flange (see Fig. 3) and the rails, which weigh 90 lbs., are spiked to the ties with tie plates underneath. A 5-in. × 8-in. ribbon guard, gained 1 in. over the ties, and a guard rail are used. The rail chairs and split rails are the Erie's standard for 90-lb. rails. These are shown in Figs. 11 and 12. The rail chairs at the draw ends are made of a ½-in. plate, 17 in. × 19 in., on which are riveted other ½-in. plates, bent as shown by sections in Fig. 11, which serve as rail guides and retainers. The rail chairs used on the draw are made of a 4-in. × 17 in. × ½ in. plate with rail guides riveted to one side, as shown by plan and elevation at the right of Fig. 11. In the split rails, the rails have a 12-in. beveled cut, and are bent so as to have web at the extreme point. Fig. 12 gives a plan and elevation showing the split rails and rail chairs as applied to a swing draw, in which case it is necessary to use rail lifts, as will be seen, to clear the rails. No rail lifts are, however, required on this bridge, since the only movement the draw has frees the rails, neither are rail chairs necessary on the draw. At the rail chairs, bolts and splices are used, it being possible to hold boats in this creek until a convenient time to open the draw. The splices are used to overcome any trouble that may be caused by the tendency of the rails to creep down from the hill beyond where there is a grade of about 46 ft. per mile.

The draw span is counterweighted by a rolling weight, which moves on a track so curved that the work done by the weight in dropping from one position to another equals that required to lift the draw through the corresponding positions.

The method by which the curve for the counterweight

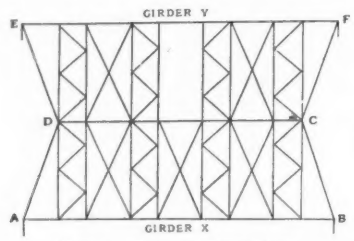


Fig. 1.—Plan of Draw-Span.

track was developed by the engineers of the railroad might quite properly be called mechanical graphics. It is simple and accurate, and a description of it may be of interest to our readers.

The weight of the draw and the position of its center of gravity having been calculated, and the height of the frame post and the size of the sheave having been determined, the tension in the counterweight rope and hence the amount of counterweight necessary to produce this tension, the draw being at the time closed, and the weight occupying an assumed position near the top of the frame, can be computed. In this case the amount of counterweight necessary to produce the above tension is practically three-fourths of the weight of the draw span. Having determined this, a form, *D*, Fig 4, representing a side elevation of the draw, was cut from a piece of cardboard. A square piece was cut out of the middle of this form, and across the hole thus made two threads were fastened by pasting their ends, as shown at *T*. The intersection of these threads represented the position of the center of gravity of the draw as calculated. A diagram drawn to the same scale (in this case ⅛ in. equalled 1 ft.) as that of the paper form had the positions of the hinge, *H*, and the sheave, *S*, located on it. On the draw side of the frame-post a system of parallel lines, one above the other and at a distance representing 1 ft. apart, was drawn. Since the amount of counterweight determined upon was three-quarters the weight of the draw, in order that the work done by the weight in dropping from one position to another may equal that necessary to raise the draw through corresponding positions, it must fall four-thirds the distance that the center of mass of the draw has been raised. Hence another system of parallel lines was laid off, each at a distance representing 1 ft. 4 in. from the other, on the track side of the post. Around the upper half of the circumference of the sheave *S*, pins, spaced about ⅞ in., were driven into the drawing board on which the diagram sheet was fastened. A fine wire, representing the counterweight rope and long enough to reach from the fastening at the end of the draw around the pins to the point representing the center of mass of the counterweight, was attached to the draw. At its free end a small loop was made to go over the point of a pencil. The hinge of the cardboard form was then fastened in its proper place near the foot of the post by a pin driven into the drawing board. By raising the cardboard draw so that the crossthreads came on one of the parallel lines, as shown in Fig. 4, and then, with the pencil in the loop, sweeping an arc so as to cut the line of a corresponding number in the other system, as at *P*, one point in the locus of the center of mass of the weight was determined. After finding a point on each line, a curve was drawn through these points. Then, with a pair of compasses set to the radius of the counterweight, small arcs were drawn with the points on the curve thus found as centers. Through the points where normals to the curve cut these arcs, another curve was drawn. This represented that of the track. The curve found by this method closely resembles the final one adopted by the bridge company, as will be seen. The actual curve from which the track was made was one swept in by arcs of different radii, as marked on Fig. 5, each radius in this drawing sweeping an arc by a movement in the direction of the hands of a clock.

The track down which the counterweight rolls is composed of two 15-in. channels, ¾-in. web, 50 lbs. to the foot, held 1 ft. 8¾ in. apart by lattice and batten plates riveted to the lower flanges, as shown by plan in Fig. 6. At intervals along the track, as well as at the splices in the track, ⅜ in. diaphragms are inserted between the channels, as seen in section of track, Fig. 6, to afford a further stiffening. The whole track is in three sections, with splices at *S* and *S'*, Fig. 5. A detail of the splice at *S* is given in Fig. 6. It consists of two ⅜-in lateral plates riveted to the inside of the channels; four ⅜-in. splice plates, two of which are 3 ft. 6½ in. long, the others being 1 ft. 9½ in. riveted to the web between the flanges; also four 3-in. × 3-in. × ⅜-in. stiffener angles fitted to the channels, and a diaphragm held in place by four 3-in. × 3-in. × $\frac{7}{16}$-in. angles.

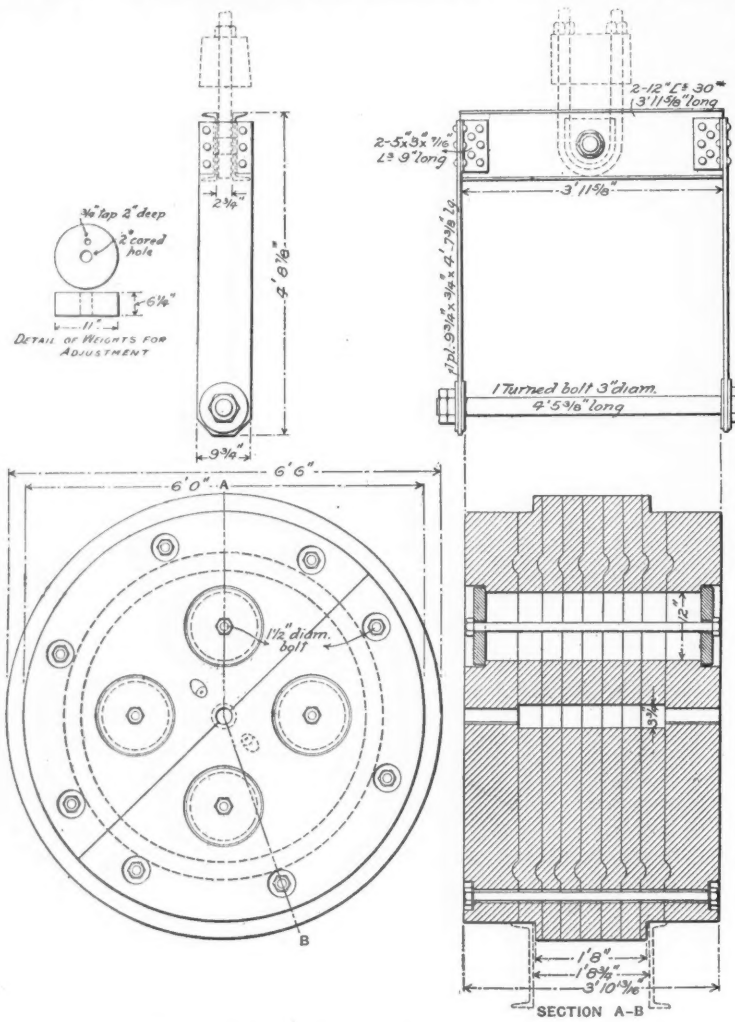


Fig. 9.—Details of Counterweights—Erie Lift Bridge.

The upper section of thetrack is 21 ft. 5 in. long, the top end of it being straight and the rest bent to an arc of a radius of about 22 ft. 2 in. The middle section is 23 ft. 10 in long, bent to an arc of about 54 ft. 9 in. radius. The lower section, which is 17 ft. 4 in. in length, is bent to arcs of different radii, as will be seen by Fig. 5.

The method used in bending the channels was to make a set of bending dies conforming to the practical curve thus obtained. The inside die, which was the more important on account of determining the exact shape of the top of the counterweight track, was then bolted to a horizontal cast bed plate. The channel to be bent was heated, and the end requiring the sharpest curvature was clamped to one end of the die and the outside die forced against it by means of hydraulic jacks. As the radius of the curvature increased the outer die was dispensed with, and the pressure of the jacks alone forced the channel into the proper curve. It was necessary to apply a template to the channel frequently to be sure that it was bending to the correct curve. The channels showed a slight tendency to bend in the form of a cone on account of the unbalanced material at the edges of the web plate. This tendency was overcome by pressing them back into shape in an ordinary bending press, using hydraulic jacks for power. After the bending was completed and the channels bent to a slightly less radius than required, the small kinks were

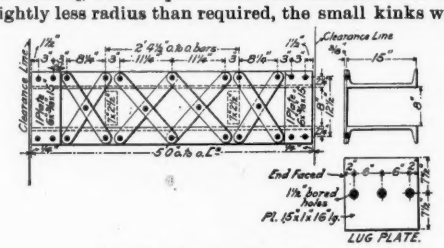


Fig. 7.—Detail of Test Beam.

taken out, which resulted in straightening them, and no great difficulty was experienced in bringing them to the proper curve.

In order that the behavior of the track of the counterweight frame, when under the load of the weight, might be known, a beam, as detailed in Fig. 7, and in which open holes were punched and reamed to $\frac{15}{16}$ in., and $\frac{1}{16}$ in. bolts instead of rivets were used, was constructed of two 15-in. 50-lb. Carnegie channels, with ¾-in. web plates, and 2½-in. × $\frac{5}{16}$-in. lattice bars. The beam was made ⅛ in. less in length than the clear distance between the longitudinal girders of the testing machine. A 15-in. × 16-in. × 1¼-in. lug plate was bolted to the inside of each of these girders with three turned wrought-iron bolts $1\frac{7}{8}$ in. in diameter. The strut was placed between the longitudinal girders of the testing machine, the web plates being in the horizontal plane, the 6-in. × ⅜-in. × 15-in. plates at the ends coming against the faced ends of the lug plates, and a load was applied at the center of the beam by placing a turned pin 6 in. in diameter between the strut and two I-beams placed on the rear crosshead of the testing machine. Deflections were observed by fastening a fine-pointed pencil to a strong wire attached to the center of the beam, the pencil resting on top of a smooth pine board rigidly fastened to the extreme ends of the test beam. The results of the test are as tabulated.

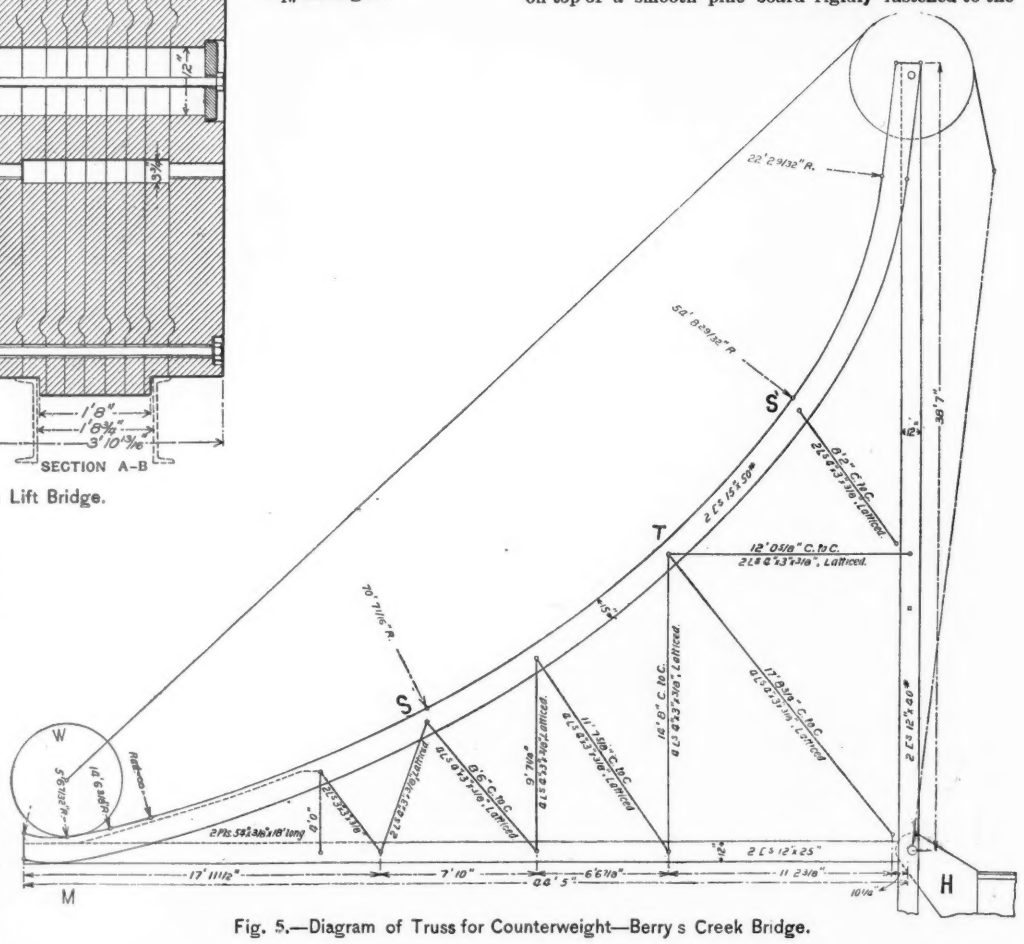


Fig. 5.—Diagram of Truss for Counterweight—Berry s Creek Bridge.

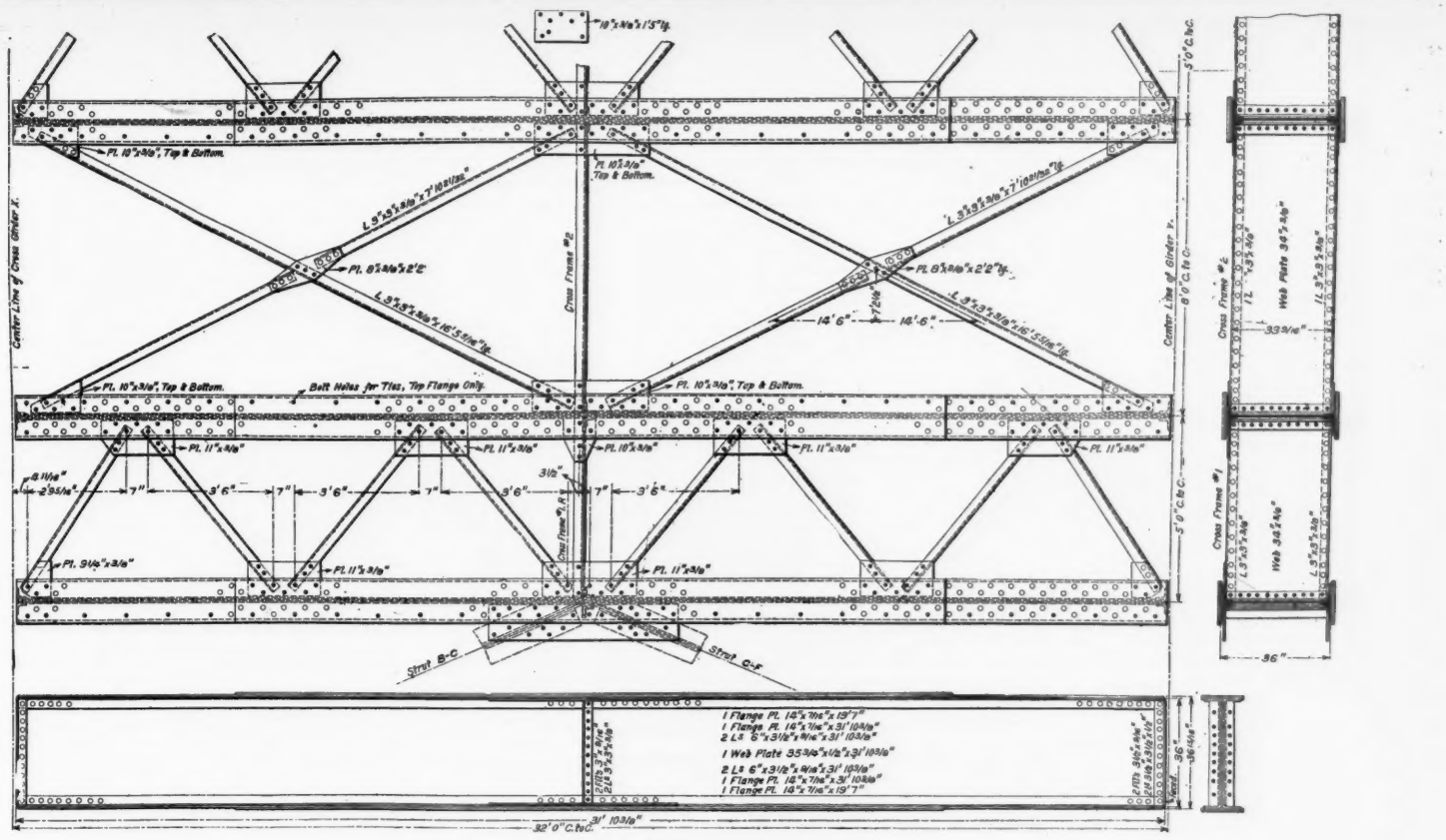


Fig. 2.—Details of Draw Span—Erie Bridge.

while the web bracing consists of latticed angles, as indicated on Fig. 5. After passing the point *T*, Fig. 5, the vertical reaction of the counterweight on the frame becomes considerable, and the part *T M H* is a truss bearing on the masonry at the point marked *M* and at the bottom of the post, which extends 4 ft. 8⅜ in. below the center of hinge *H*, Fig. 5, to the foundation beneath the draw.

When the draw is closed, anchorage is needed at the end, *M*, of the weight frame. This is accomplished by rods passing down through the masonry to plates underneath the grillage on which it is founded.

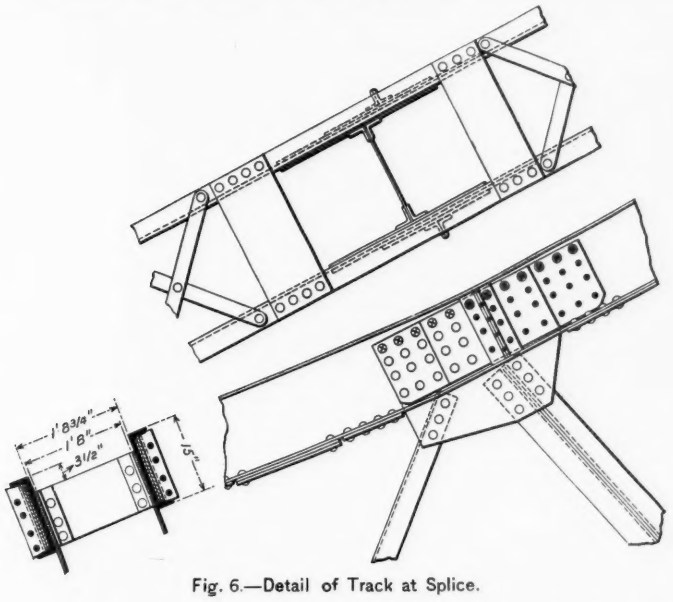


Fig. 6.—Detail of Track at Splice.

The hinges of the draw are made of two ⅝-in. plates riveted together, as shown in Fig. 8, and strengthened by a 5-in. × 3-in. × ⅝-in. angle riveted on the track side. On either side of these plates a cast-iron bushing 4½ in. thick is bolted by six 1¼-in. bolts. Through these bushings and the plates a hole is bored for a 5-in. hinge pin. The hinges thus made are riveted to the ends of the header girder *X*, and to the struts *A D* and *B C*. Each hinge is near the foot of the post, and opposite the strut member of the truss. The post is bored for a 5-in. pin, and two collars are placed on the pin to keep the hinge in place and away from the flanges of the channels forming the post, they being turned inward. The hole for the hinge pin is slotted, being 5 in. on the horizontal axis and 5⅛ on the vertical when the draw is down, and was bored while the bushings were bolted in place. The hinges are bored in this manner to prevent any stress, due to live load, coming on the hinges when the draw is closed. To accomplish this, and at the same time prevent stresses, due to moving load, in the header girder *X*, adjustable bearings are placed on the foundation beneath the header girder at the end of each longitudinal girder. These bearings consist of piles of plates varying by sixteenths from 1/16 in. to ⅝ in. in thickness. To one side, and 2½ in. from opposite edges and flush with a third of a ⅝ in. plate, 19 in. × 23 in., drilled with 1⅛-in. bolt holes near its four corners, two plates, ¾ in. and ⅞ in. thick, and 13 in. × 14 in., are fastened with nine countersunk rivets. Beneath this system of three plates, the plates of various thicknesses, which are also 19 in. × 23 in. and drilled near their corners, are piled up to the required height, the whole being held in place by four bolts fastened in the foundation and extending through the holes in the corners of the plates. Stresses due to moving load are prevented in girder *Y* in a similar manner.

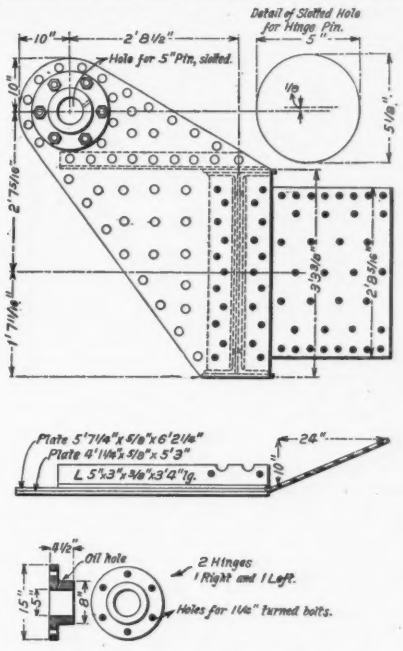
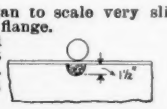
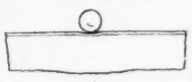


Fig. 8.—Details of Hinges of Draw.

The counterweights are 6 ft. 6 in. in diameter over all, and composed of nine sections, as shown in Fig. 9, each of two semi-circular segments, so placed as to bond, the whole being held together by eight 1½-in. bolts. In each counterweight there are four 12-in. cored holes to receive the adjusting weights, which are circular discs 11 in. in diameter, 6¼ in. thick, with a 2-in. cored hole through their center. These are held in place in each hole by a 1½-in. bolt through two plates fitting into counter-bored holes in the outer castings. The weight of the 24 adjustment weights for one counterweight is about 3,600 lbs. The weight of each counterweight, including fittings, and with three quarters of adjusting weights in the holes, is about 51,100 lbs. The fittings of each counterweight consist of a stirrup made of two 12-in. channels with ¾-in. plates extending down from their ends, as shown in Fig. 9, and with a 3-in. turned bolt to go through a central hole in counterweight and act as an axle. Each counterweight exerts its effort at the end of the draw through a 1¾-in. steel wire cable, which passes over a sheave 6 ft. 6½ in. in diameter, turn-

RESULTS OF EXPERIMENT MADE ON TEST BEAM FOR BERRY'S CREEK BRIDGE.

Load on two channels in pounds.	Moment, in pounds.	Extreme fiber stress, in pounds per square inch.	Deflection, in inches.	Remarks.
102,000	1,504,500	14,227	1/32 nearly	No set.
160,000	2,360,000	22,320	1/16 nearly	No set. Under side of flange began to scale very slightly at fillet. Elastic limit passed for flange.
210,000	3,097,500	29,280	3/16	Permanent set. Elastic limit passed for beam as a whole. Scaling at under side of flange more marked. Web started to scale, extending 1½ in. from the flange, thus: 
257,000	3,790,750	35,850	1/4	Compression more marked. Scaling of web extended 2 in. from flange.
312,000	4,602,000	43,520	5/16	Bottom flange began to scale at about 275,000 lbs. Scaling of web extended 6 in. down from top flange, thus: 
				Flange of channel perceptibly out of line under pin at center, thus: 
357,000	5,265,750	49,800	3/8	Flange deformed under pin. Depression of about 1/16 in. at web and edge of flange 1/8 in. below web, thus:  Web and both flanges scaled.
371,000	5,472,250	51,750	Lost	Three iron bolts, 1 7/8 in. in diameter, holding lug plate, sheared off, stopping test.

ing on a 4-in. pin at the top of the frame post. This cable is attached, by means of fittings, to a 1¼-in. plate riveted to the end of the header girder *Y*.

The amount of the counterweight and its path are such that there will always be a reaction at the outer end of the lift span. This reaction is the force that closes the draw, the opening being done by hand power. The draw which with the track and floor weighs 140,000 lbs., and exerts a reaction of 38,000 lbs. at each end of girder *Y*, of which about 1,000 lbs. is left unbalanced, is raised by two ⅝-in. steel-wire ropes nearly parallel to the counterweight cables and faintly visible in Fig. 10, each passing over a 23-in. sheave at the top of the post and down to a crab near the hinge. Each of these small sheaves, by means of a wheel bolted to its side, gears into a smaller wheel on a 1¾-in. shaft, which is supported in bearings fastened to the web of the I-beam, which forms the top chord of the portal bracing. This shaft extends from one post to the other, connecting the two sheaves, and thus compelling the lift to be equal at each side. The crabs are conveniently operated by a single man at each frame.

The structure was very expeditiously erected. As entire new masonry for the four tracks was required, the traffic was taken wholly out of the way by placing the main tracks on a run around with a temporary wooden lift draw. The main girders of the fixed spans were placed in position by a pile driver, no false work being used whatever. The draw was framed together on a large scow, while the counterweights were erected at the bottom of the curve.

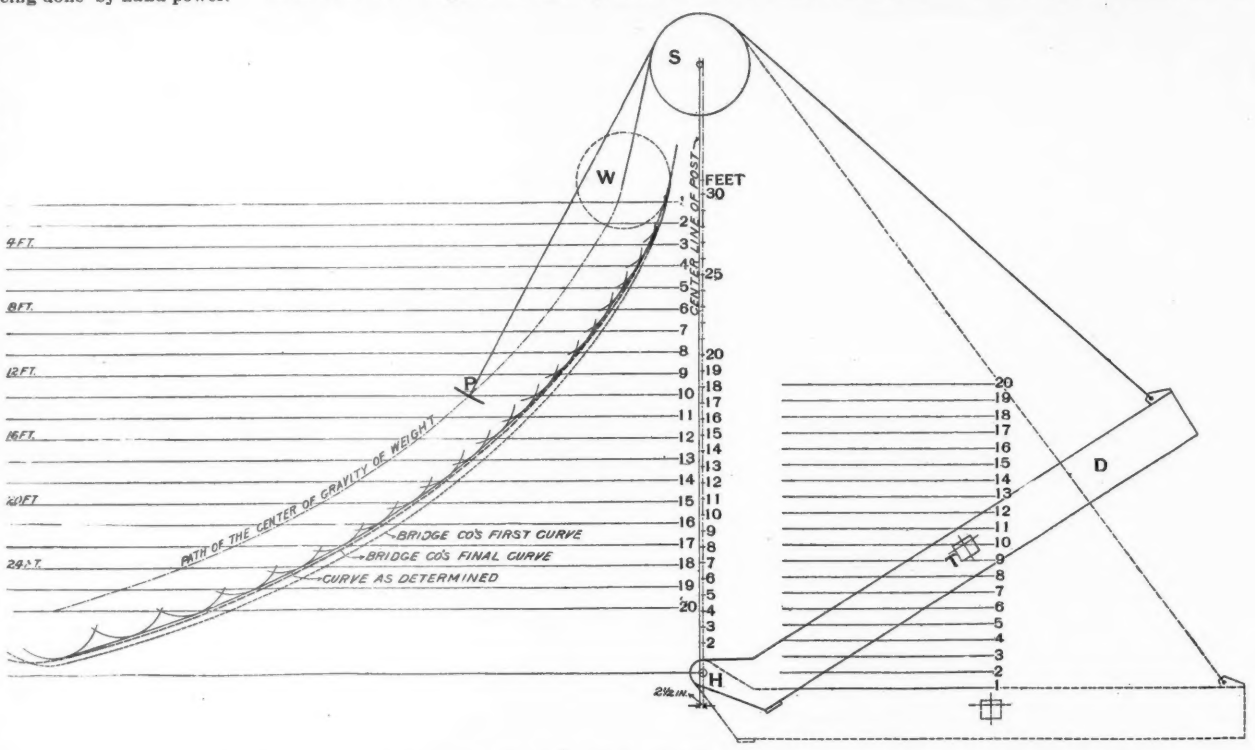


Fig. 4.—Diagram for Experimentally Determining the Curve of the Track of the Counterweight for Berry's Creek Bridge.

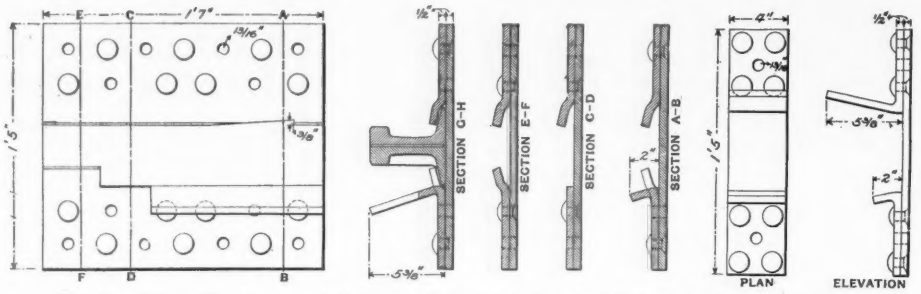


Fig. 11.—Plans, Elevations and Sections of the Erie's Standard Rail Chairs for Draw Bridges

The draw, after being floated into place and hinged, was lifted to its upright position and the attachment to the counterweights made. It was then pulled down to a horizontal position to allow the ties and track being put in place. These have brought to the draw its expected reaction, which should be, with three-fourths of the adjustment in the counterweights, about a ton.

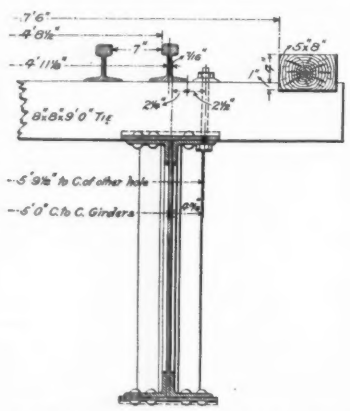


Fig. 3.—Details of Lift Span — Section Through Stringer, Rail and Guards.

The bridge was built by the Union Bridge Co. under the direction of Chs. W. Buchholz, Chief Engineer of the Erie Railroad.

The New Interlocking Plant at Hartford.

At the November meeting of the Railway Signaling Club, Chicago, a paper was read by Mr. A. H. Rudd, of the New York, New Haven & Hartford, of which the following is an abstract:

In 1852 the New England Railroad crossed the New York, New Haven & Hartford at grade, near Hartford, Conn., the crossing being governed by the familiar red ball hoisted on a pole. In 1870 both roads were double tracked and a new device was installed which governed trains by a combination of a disk on top of the tower and by lights through the windows of the tower itself. In June, 1883, the Pennsylvania Steel Company installed an interlocking machine, which was used 12 years with hardly any repairs and with little inspection. Its only counterpart exists, I believe, at Hagerstown, Md. In 1896 it was found necessary to build a more modern plant and the first "National" machine of 1896 was put in and has attracted considerable attention. It is built by the National Switch & Signal Co., of Easton, Pa. I believe it is as nearly perfect as one can be made. A description of it appeared in the *Railroad Gazette* of Aug. 14 and in the *Railway Review* of May 16, 1896. "Union" patent rocker shafts are used in the lead out. One "National" switch and lock movement is used operating two siding derails. At all other points we have employed the "Union" facing point lock, the lock rod being provided with a screw jaw adjustment, and the front rod with slotted lugs of my own design, which permit the rail to travel considerably without causing trouble. For ordinary use a ⅜-in. jaw pin is inserted in the lug slot, and removed as the motion of the switch causes the lock to bind. At the slips "National" rocker shafts are used for operating the locks and bars, the carriers for bearings being all altered so as to raise the shaft 2 in. higher than those furnished by the signal company, giving better results in track maintenance and drainage. The Boylett rail clip, which fastens on the tie and combines rail brace, riser plate and clip, has been employed throughout, and is giving great satisfaction. It is more difficult to apply to slips, than the "Union" or "Johnson" patterns, but after it is in place it gives an easier working bar. The stroke is less than in either of the clips mentioned. Long slotted lugs were used to lose stroke, but the strain was so great at about one-third the travel of the lever, that these were abandoned and stroke was gained for the plungers on the bell crank, making a rather awkward cross-over to reach the shaft. On another similar installation I should order the rocker shaft extra long and lead from outside hole of crank to plunger and from inside hole to the shaft. The switches as far as possible are worked by threaded rods traveling for an inch or two idle through the special cage made by the Union Switch & Signal Co. "Union" jaws and lugs are also employed with "Johnson" low dwarf signals and "National" lead-out pipe carriers in tower, with rigid base anti-friction ones outside. One-way lazy jack compensators were used of the latest "National" design.

The soil is known as "Hartford clay"—in the early spring it is quarried with adzes, and most of the grading for the new tower was done in this way. As the frost comes out of it, it runs, having a viscosity similar to that of warm tar. We borrowed Mr. Miles' ideas with variations, and made our piers of concrete, designed with the idea of preventing the clay from working under any projections and lifting them and sloping the sides so as to have all the heaving exert upward pressure on the bottom. Whether we have been successful or not the winter will show. The lead-out timbers were set in one big bed of concrete 4 ft. deep, with large stone at the bottom. The large piers for cranks were made by digging holes in the clay 18 in. square by 4 ft. to 4 ft. 6 in. deep, and filling them with concrete well puddled and tamped during the operation. In addition to substituting movable point frogs for the stiff ones, four sets of slips were put in.

Not a switch has yet been run through or damaged. The authorized speed of all trains over the junction is eight miles an hour, and the average number of train movements is, from 8 a. m. until 4 p. m., 101; from 4 p. m. until 12 midnight, 82; 12 until 8 a. m., 57.

The electrical part of the work has some new features. Westbound Valley trains are rung in from a Hall track instrument, all others from push buttons in switchmen's or gatemen's cabins. Repeaters are operated by the distant signals. When the signal is at caution, the circuit is closed through a single contact commutator, and the indicator shows caution. When the signal is cleared, the circuit is opened and the repeater shows clear. Obviously, only failure of the current drops the indicator to clear. Electric locks of the Hansel patent are used in such a manner that the lever can be put home at any time, but while any wheels are on the track

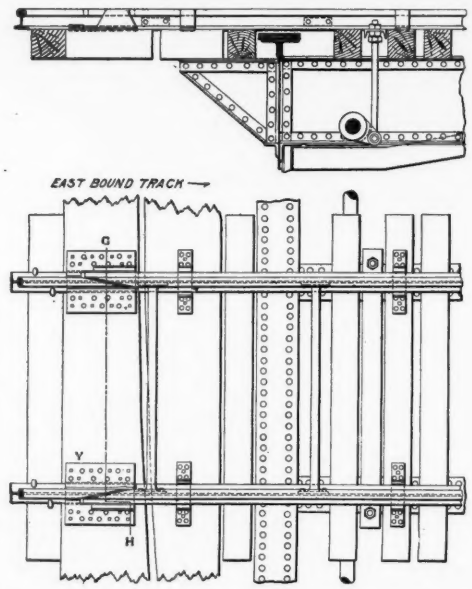


Fig. 12.—Plan and Elevation of a Swing Draw, Showing Rail Chairs and Split Rails

circuit between the distant signals and the frogs, the latch cannot be put normal, the result being that the route cannot be changed until the train is over the interlocking.

On the Hartford division a block system has been put in service during the past two weeks, which we consider the equal in economy, efficiency and elasticity of any now in use. The Hall signals are extensively used on this division, and the blocks immediately in the rear and advance of the interlocking are protected by them. The problem was to interlock them with the tower. Taking, for example, the eastbound track, the method is as follows:

A banjo-signal in the rear of the distant-signal is set by its own track circuit and held set also by the circuit previously referred to, between the distant-signal and the frogs. The main battery for this banjo-signal is in the tower. The main wire passes through the magnets and front contacts of a main relay, then through an indicator in the tower and the front contacts of the track relays to the banjo. An auxiliary circuit from the same

battery passes through the magnets of the main relay and through three circuit-closers and back to the battery. These circuit-closers are fastened to the locking-frame in such a manner that they are normally all closed, but if the latch is pulled the circuit is opened. The result is that with the levers normal the main relay is always closed and the banjo operates on the well-known track-circuit principle. Should, however, either of the levers be pulled the banjo is still clear, as it holds its main relay closed until a train strikes the circuit, when the main relay is opened and cannot be closed until the auxiliary circuit is again completed by restoring the semaphore to danger. However, before the latch can be put down far enough to close the circuit closer it is locked by another Hansel lock operated on a track circuit extending from the northeast side of the frogs to the next banjo. It appears, therefore, that after the rear banjo has been set by a train it cannot be cleared until the train has passed inside the home signal. This home signal latch cannot be put normal until the rear of the train has reached the frogs, and when it is restored it is locked as soon as the front end of the train has cleared the frogs and held so until the rear of the train is protected by the advance banjo. A third Hansel lock included in the main circuit of the advance banjo is applied to distant signal No. 1, so that if the banjo is set the plunger is inserted and No. 1 cannot be cleared as long as 78's circuit is open. The system is a success thus far.

A Tank Locomotive on the Pennsylvania Lines.

This engine was especially designed for use on Madison Hill, Ind., on the Louisville Division of the Southwest System of the Pennsylvania lines. The peculiar conditions of the service at this place necessitated many departures from customary locomotive construction, and the proportions of the engine are consequently somewhat different from ordinary practice, and do not entirely conform to the rules recommended by the Master Mechanics' Association.

The grade upon which this engine works is one of the steepest in the world upon which a regular passenger and freight service is maintained with the use of adhesive power alone. The length of the grade is 7,012 ft., and the total elevation is 413 ft., making a ratio of 311 ft. per mile, or approximately a 5.9 per cent. rise.

When ascending this grade the cars, as a precaution in case of broken couplings, are pushed before the engine, and when descending the engine backs down preceding the cars. It is to be understood that the regular road engines are disconnected from their trains at the top of the grade, and left there waiting for the next train brought up by the hill engine.

In order to prevent the trains from gaining too much headway during the descent, the engine is equipped with an interesting arrangement for regulating the speed. This device is based on the principle of the Le Chatelier brake, and is in some respects similar to that used on several of the western mountain roads. It consists of connecting the valve chests with a 1½ in. pipe from which a 2-in. connection runs back to a point below the cab floor at the engineer's side where it terminates in a muffler. When descending the hill the link motion of the engine is reversed so that the cylinders during a portion of the stroke will force air up into the valve chests and from there through this pipe to the muffler where it will escape into the atmosphere. By means of a regulating valve below the cab floor the escape of the air can be checked so as to obtain the desirable speed for the pistons and consequently for the engine. By closing the valve entirely the engine can be stopped during the descent. In order to prevent the pistons from sucking in air from the smoke-box with accompanying cinders and grit, a steam jet is directed upward through the exhaust column from an opening in the hollow wall dividing the two exhaust passages. Fresh, clean air is admitted into the cylinders from a connection at the exhaust column base which leads to the outside of the smoke-box, and is shown over the valve chest in the illustration. This connection can be opened or closed by means of a valve operated from the cab, and it is apparent that it must be opened only when descending the grade. In order to lubricate the cylinders a small jet of hot water is let into each exhaust passage. Besides this regulating device the engine is equipped with the American driver brake, and in addition a powerful screw hand brake, which alone will hold the engine and train on the grade.

The service for which the engine was designed necessitated a departure from the customary proportions of locomotives. Ordinarily, a road engine has to exercise its entire hauling capacity only when starting a train and getting up speed, but during the majority of the time only a fraction of the total power is needed. The total adhesive weight on the drivers is never utilized when the train is running at its regular speed with the lever hooked up toward the middle. It is then that the economy of expansion comes in. If a road engine should be so situated as to have to make a continuous start lasting during its whole run, it would be under the same conditions as when going up a steep grade. The exertion of the full adhesive power is consequently not the exception, but the normal condition of work on Madison Hill. To use steam expansively under these conditions would be impossible, unless the cylinders were of much greater proportions with regard to the adhesive weight than on the ordinary road engine. The total weight of the new engine is 140,000 lbs., all adhesive weight, but the mean weight during the ascent is about 130,000 lbs., based on consuming ⅔ of the water in the side tanks. According to ordinary practice, this weight would require a cylinder proportion of about 22 in. × 24¾ in. The additional 3¼ in. of stroke, which this engine has, is a clear gain in the expansion of the steam, over and above that which may be produced when the engine does not exert its full adhesive power up to the slipping point. In other words, the cylinders were made as large as it was practical to make them, and the economy of this is shown by the fact that ordinarily the engine is able to make three round trips up and down the hill without refilling its coal bunk, which holds only a ton and a half of coal.

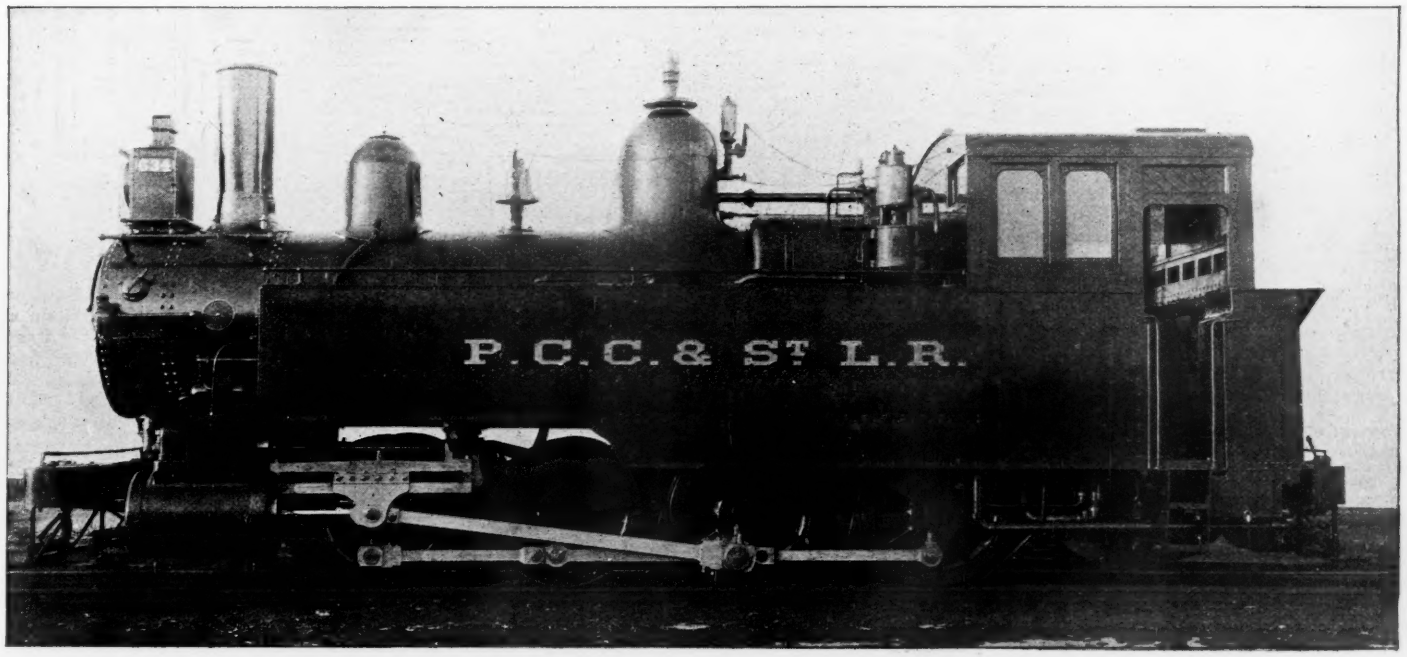
The engine was put in service the first of the year, and has been giving entire satisfaction ever since. No official test of its hauling capacity has yet been made, although it is the intention to make one soon in order to obtain reliable data for comparison and future use. It can be said now, however, that the engine has fully met the expectations of the officials, and its performance during the ascent as well as the descent is entirely satisfactory.

Quite a number of interesting details had to be considered in the design of the engine. In order to keep the front end of the top row of flues under water on the grade without filling the boiler so full as to cause the engine to throw water, the back end of the boiler is set considerably higher than the front end. The throttle valve is of the ordinary balance type, but it has no play on its stem, the object being to avoid the clattering of the valve upon its seat in case the compression in the steam-chest should exceed the boiler-pressure during the descent. To protect the steam-chests a relief-valve has been placed on each, which is set just beyond boiler-pressure. In arranging the driving-springs for the engine it was calculated that the front springs would receive the greatest load and they were designed accordingly. When the engine is on the grade, however, its center of gravity is shifted backward, and, in consequence, the rear springs receive the greatest load, which caused some little inconvenience at first.

Instead of metallic piston-rod packing, asbestos cord is used, as the metallic packing would be apt to be damaged when the engine is drifting down the hill without steam. The engine is equipped with pneumatic bell ringer, pneumatic sand valves, steam heat for passenger trains and all modern improvements.

The general dimensions of this engine are as follows:

Gage	4 ft 8½ in.
Fuel	Bituminous coal
Driving wheels, number	8
" diameter	50 in.
Driving axle journals	8×8½ in.
Wheel base (all rigid)	15 ft. 2 in.
Cylinders: Diameter	22 in.
" Stroke	28 in.
" Spread of centers	7 ft. 4 in.
Crosshead	Solid cast steel
Main rod, length between centers	9 ft. 10⅝ in.
Valve gear: Stephenson link motion. Richardson balance valve	
" Steam ports	1½×18 in.
" Exhaust ports	2¾×18 in.
" Outside lap	1 in.
" Inside lap	1/8 in.
" Valve travel	5 in.
" Lead	1/8 in.
Boiler: Inside diameter of barrel	5 ft.
" Thickness of sheet	⅝ in.
" Height from rail to center	7 ft. 6 in.
" Steam pressure	150 lbs.
Firebox:	Belpaire
" Length inside	7 ft. 9½ in.
" Width inside, at top	3 ft. 11⅛ in.
" " " at bottom	3 ft. 6 in.
" Depth	4 ft. 9⅛ in.
" Thickness of crown sheet	⅜ in.
" Thickness of flue sheet	⅜ in.
" Thickness of side sheet	1/8 in.
" Grate area	27 sq. ft.
Tubes: Number	219
" Diameter outside	2 in.
" Pitch	2⅜ in.
" Length between tube sheets	13 ft. 4⅝ in.
" Total area of tube sections	3.65 sq. ft.
Heating Surface: Firebox	142.86 sq. ft.
" " Tubes, Exterior	1,528.89 sq. ft.
" " Total	1,671.75 sq ft.
" " Ratio to grate area	61.91 to 1
Exhaust Nozzle	Single
" " Diameter	5 in.
Smokestack: Minimum diameter	18 in.
" " Height from Rail	15 ft.
Capacity of tanks	2,000 gals.
Capacity of coal space	3,000 lbs.
Tractive power, per pound effective pressure on piston	271 lbs.
Total tractive power, with 30 per cent. of boiler pressure	32,520 lbs.
Total adhesive power, at 25 per cent. weight on drivers	35,000 lbs.
Weight in working order	140,000 lbs.



A Tank Locomotive on the Pennsylvania Lines.

The Tonnage Rating of Locomotives and its Effect on Fuel Consumption.

At the meeting of the New England Railroad Club, held Oct. 13, the subject for discussion was "The Tonnage Rating of Locomotives and its Effect on Fuel Consumption," continued from the May meeting, and of which the following is an abstract:

Mr. JOHN MEDWAY: Since our last business meeting we have had on the Fitchburg road four months' further experience in the rating of locomotives on a tonnage basis, and in connection therewith the keeping of an individual fuel account with the engineman. I am able to say that the results are most gratifying. Since April last we have, with the same class of locomotives, increased the average tonnage per train seven per cent. The trainloads have been more nearly uniform, and there have been comparatively few cases of "stalling" and doubling on the hills.

In the very important matter of fuel economy our expectations have been fully realized. It must be understood that with the new system comes a large amount of detail work, which must be followed closely and persistently. It necessarily involves an added labor expense. With us it is quite small—simply the employment of two additional men. I may safely say that the results are so satisfactory that if it were necessary to employ 100 extra men there would then remain a good margin of profit.

THE PRESIDENT: The tonnage rating of locomotives for service seems to be about the only way that we can rate locomotives to-day, because we have in our service cars that have a capacity all the way from 20,000 to 80,000 lbs. To rate locomotives by cars as they did 15 years ago would be an impossibility.

I have a few statistics of the work our consolidation engines are doing between New London and Providence. I have got at this as well as I could. I do not claim it is strictly accurate, but approximately so. Here is a freight engine with 21×26 cylinder, 51-in. driving wheels, 72-in. boiler shell, weight of about 154,000 lbs., and firebox 43×120. I took engine No. 300 and followed it for 30

round trips in May and June, 1896, and I have tabulated the result as follows:

Total cars hauled	2,404
" " " loaded	1,448
" " " empty	956
" tons freight hauled	21,690
" " dead weight hauled	35,030
" pounds coal burned	314,300
" engine mileage	3,840
Mileage for one round trip	128
Average number cars per train, 24 loads and 16 empty	40
" " net tons of freight per train	360
" " net tons of empty cars plus weight of cars loaded	600
Average coal consumed per train of 40 cars for 64 miles	5,256 lbs.
" " " " ton hauled 64 miles	.546 "
" " " " " " 1 mile	.085 "

This calculation is assuming average car weighs 30,000 lbs. Average load of freight weighs 30,000 lbs.

Fully half of the cars hauled were Pennsylvania, Lehigh Valley and Philadelphia & Reading cars, that have a light weight of about 34,000 lbs. The others are home cars of about 25,000 lbs. weight; average of the whole, 30,000 lbs. each. The loads are estimated at 30,000 lbs. This is not a rating for those engines, only a comparative record of work performed and coal consumed.

Those engines are capable of taking 50 loaded cars in either direction. It is plain to be seen that this time instead of hauling 40 cars they could have hauled 50 loaded cars, and that would have brought the amount of coal consumption per ton hauled lower than I have it, because I claim an engine can go fully or reasonably loaded without any very material extra expense.

Mr. MEDWAY: I would like to draw the members out in regard to the size of driving wheels, and to emphasize the fact that fuel economy depends very largely on the size of the driving wheels. I believe that usually they are altogether too small. I have had that idea for several years past, and some time ago I changed a class of engines which had wheel centers of 49¼ diameter to 51 in. I did this by turning off the old tires, and found that we had a great deal more mileage between tire turnings.

I have tabulated the result as follows:

Fitchburg Railroad.

Table showing the result of increasing the diameter of locomotive driving-wheels from 53½ in. to 58 in. diameter. Also, a comparison with locomotives having driving-wheels 63 in. diameter.

Reference number.	Engine number.	Period of tire wear.	Corresponding number months' service between tire turnings.	Mileage.	Diameter of wheel center.	Diameter outside of tire.
1	258	April 28, '94 April 29, 95	12	50,158	49¼ in.	53½ in.
2	258	April 29, '95 Sept. 29, '96	17	57,325, or 14 per cent. gain over No. 1.	51 in (new tires over old ones).	58 in.
3	155	Feb., '95, to Sept., '95	19	66,934	56 in.	63 in.
4	156	Feb., '95, to July 29, '96	17	68,492, or 36 per cent. over No. 1.	56 in.	63 in.

I will say that we treated all other engines in that class in the same manner. We have a relative fuel economy. I cannot give comparative figures, as our old way of keeping fuel accounts would not be a fair comparison with the new system on a freight tonnage basis.

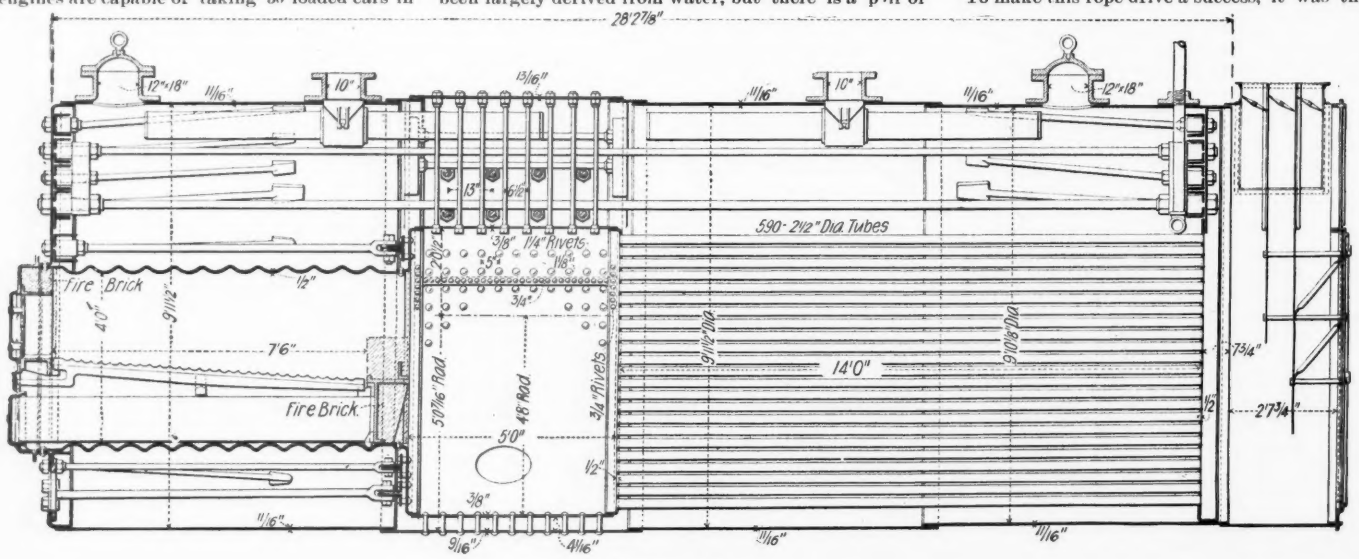
THE PRESIDENT: I have been satisfied for quite a while that the size of wheels has had a good deal to do with the fuel consumption. I believe that with a wheel that is too small, unless you are going to run it at a low rate of speed so there will be no slip, there will be quite a waste in fuel, and I have made up my mind that a wheel say of 56 in., making with the tire 63 in., as we are making the tire now 3½ in. thick, of course doing the same work and going the same distance with less revolution, makes a difference of fuel consumption, provided you have a boiler large enough and power enough behind to drive those wheels up to speed; and I believe in designing locomotives with that end in view.

Mr. MEDWAY. On the Western division all our freight engines are built with large wheel centers, 56 in.; outside diameter of wheel, 63 in. The other day we were a little short of power over there, and our master mechanic sent over a consolidation, wheels 54 in. diameter. Now, the consolidation would simply do nothing as compared with those other engines. It made shockingly poor coal records and could not get over the road in time.

Mr. J. T. CHAMBERLAIN: There is no question that the load hauled to-day by the locomotive is vastly different from that of 10, 12 or 15 years ago, and your cars are heavier. They are talking now about an 80,000 lb. car. At the same time, it is questionable whether or not the tonnage has increased in the same proportion as the cars have increased in the last three or four years. I found, some 12 years ago, that the average tonnage of all freight cars for 12 months arriving at Boston was very close to six tons, 12,000 lbs., and I question to-day whether the average train load, take the bitter with the sweet, exceeds 12 tons.

The Power Plant of the Washington Mills, Lawrence, Mass.

The Washington Mills of Lawrence, Mass., are now the largest woolen mills in the world. The power has been largely derived from water, but there is a pair of 30-in. × 60 in. horizontal, non-condensing engines, designed by Mr. E. D. Leavitt and built by the Dickson Manufacturing Company, of Scranton, Pa., that are worked up to from 2,000 to 2,400 I. H. P. constantly. The exhaust steam from these engines is all used in the dye-house. Recently Messrs. Dean & Main, of Boston, have put in 1,100 H. P. of Hercules water wheels, making the total water power of the mill at ordinary stages of the river 3,500 H. P.



Longitudinal Section.

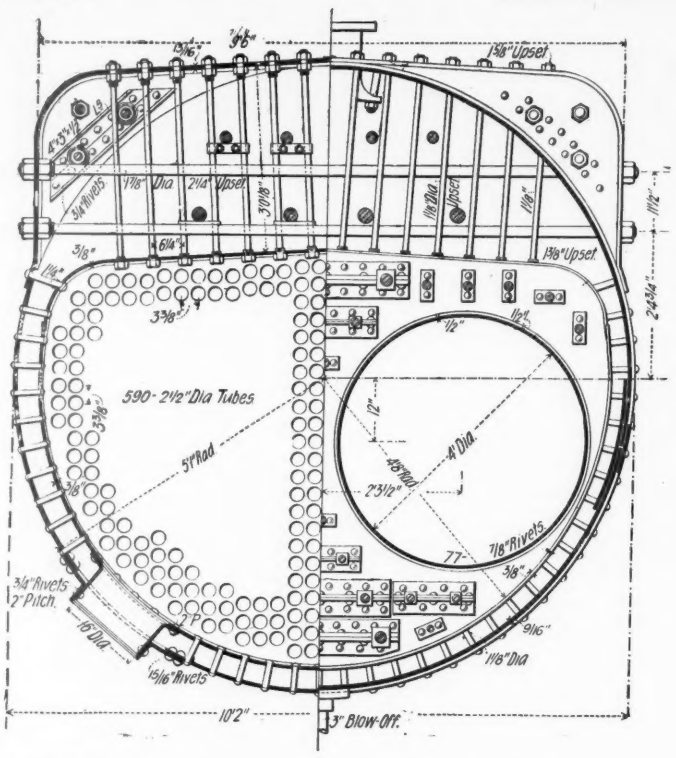
Boiler for Washington Mills Power Plant—Designed by Messrs. Dean and Main.

The above total of steam and water power, amounting to nearly 6,000 H. P., has been insufficient during times of even small amounts of back water in the river, especially as 750 H. P. is required to drive the electric lighting dynamos during lighting-up time. The near future will see this increased to 1,000 H. P.

Rope Driving.—The 1,100-H. P. water wheels above referred to were situated so as to utilize an old waterway from the canal to the river; but this was far from the mill where the power was needed. It was necessary to transfer the power by a shaft westward some 80 ft., and then southerly 103 ft., and vertically about 25 ft., and it was decided to use for this purpose the "American" or continuous rope drive. This drive is interesting, if not unique, because of its great length and the great power transmitted. The rope wheels have 24 grooves for 1¾-in. rope, and 7,000 ft. of rope is used. The speed of the rope is 5,026 ft. per minute. The Kenyon cotton rope is used. The main rope wheel on the water-wheel shaft is 10 ft. in diameter, from which the rope passes upward, and thence over two 72-in. sheaves horizontally to the receiving wheel 76 in. in diameter. The horizontal ropes are supported by two 72-in. carrying sheaves, and there is one 72-in. sheave used to direct one strand of the rope to the inclined take-up sheave which travels on a carriage. The movement of the take-up is very slight and maintains the tension of the rope satisfactorily.

To make this rope drive a success, it was thought to be only necessary to support it on a very rigid structure from one end to the other, in order to maintain alignment and prevent vibration. A regular truss was used from one end to the other, with chords and posts of heavy Southern pine, and diagonal straining rods in vertical and horizontal planes, provided with right and left-hand nuts, the whole being firmly anchored to foundations.

The drive is successful, and it is impossible to say from its behavior, which is perfectly quiet, whether it is carrying a load or not.



Half-Section through Combustion Chamber. *Half-Section through Furnace.*

Boiler for Washington Mills Power Plant,

Boilers.—About the time the rope drive was undertaken, it was necessary to provide additional boilers. The boiler-house was full, having eleven horizontal return tubular boilers 78 in. in diameter, having 2,190 sq. ft. of heating surface (on the fire sides) each, or 24,090 sq. ft. in all, and carrying 135 lbs. of steam. Although the grates were large, being 8 ft. × 7 ft., 25 lbs. of coal was being burned per square foot per hour.

There was no place about the mill where a new boiler-house could be built. There was, however, a space of little value the other side of the end wall of the boiler-house, and otherwise forming its continuation, except that the overhead floor was much lower than that in the boiler-house, which had been made high to accommodate horizontal return tubular boilers. To raise this floor was a very expensive job, and besides this it would ruin the room above for manufacturing purposes.

It was seen, however, that a special design of boiler could be made that could be accommodated in the space at hand. The design shown was prepared by Messrs. Dean & Main, and two boilers were built by the Atlantic Works, East Boston, Mass.

Each boiler has two 48-in. Morrison corrugated furnaces, entering a combustion chamber, from which pass 590 tubes 2½ in. outside diameter to the smoke-box. The grates are 7 ft. 6 in. long, the bridge wall 12 in. long, the combustion chamber 5 ft. long and 6 ft. 8 in.

high, and the tubes are 14 ft. long between the heads. The length of the boiler over all is about 31 ft. The heating surface of each boiler is 5,300 sq. ft., the grate surface 62.20 sq. ft., and the ratio of one to the other 85.2 to 1.

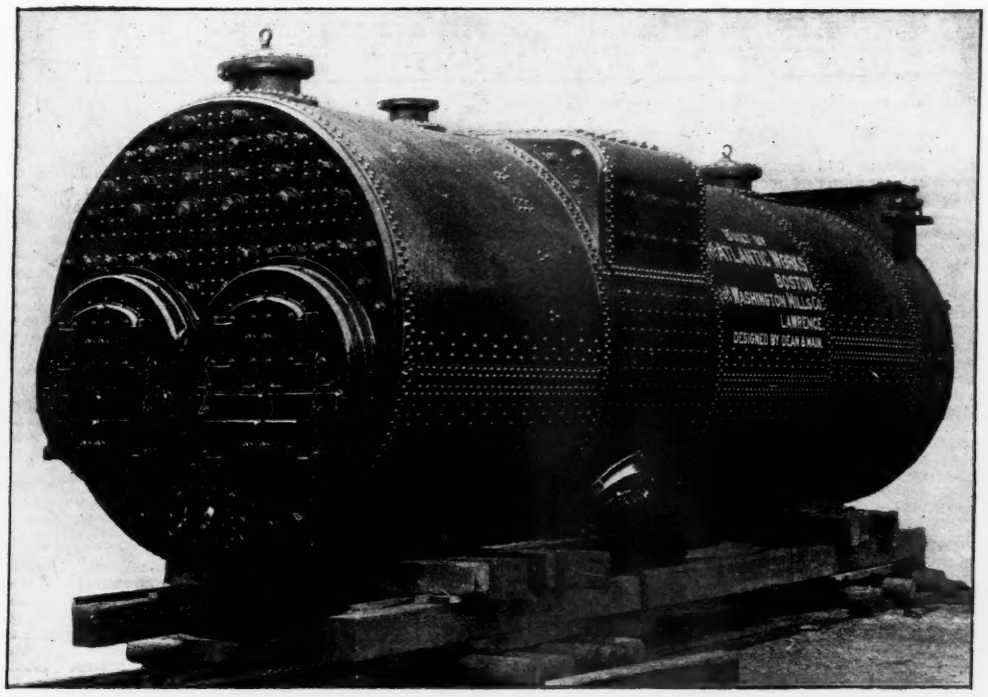
The unusual ratio of 85 to 1 was adopted because it is probable that these boilers will be rushed as the old boilers have been, and it is desirable to have enough surface to take up the heat evolved. The relation has been made between coal burnt and heating surface, rather than between grate surface and heating surface.

The minimum inside diameter of the boilers is 9 ft. 10⅛ in. and the maximum outside diameter 10 ft. 2 in. The weight empty of each boiler is 90,000 lbs., and the weight of water held by one boiler is 60,000 lbs., so that the working weight of one boiler is 75 tons in addition to the weight of the steam pipes, etc,, resting upon it.

Each boiler rests upon two cast-iron cradles, one of which is stationary and the other upon rollers of cold-rolled shafting, to permit free expansion and contraction. Each boiler has two 6-in. pop safety valves set to blow at 135 lbs by the gage. It is intended to have one fireman to each boiler and to burn one ton of coal an hour under each.

Each plate of the boilers has been tested by the Pittsburgh Testing Laboratory, and all rivet, stay-bolt and tube holes have been drilled in place and the rivets driven by hydraulic machine.

The Engine.—In view of the great amount of power required to drive the lighting dynamos, and of the importance of being as independent of low and back water as possible, it was decided to put in a new engine of some



Boiler for the Washington Mills Power Plant.

1,000 or 2,000 economical horse power, capable of working at much greater power.

The proper location of the engine was somewhat of a problem; but it was best to have it drive on to the new water-wheel shaft. Accordingly this shaft was extended westerly beyond the rope drive, and, on account of scarcity of room, it was finally decided to take the rather bold step of placing this engine in the line of the above-mentioned shaft, which runs at 160 revolutions a minute. It was decided also to have a vertical engine in order to save room, do away with cylinder cutting and to reduce friction, to say nothing of saving cylinder oil. There are a sufficient number of precedents for fast-running large-power engines at present to make this a safe project if the engine is designed with sufficient attention to the mathematics of the problem.

Specifications were drawn up by Messrs. Dean & Main for an engine having the following leading characteristics:

Vertical, inverted, four-valve, cross-compound, surface condensing, thoroughly steam-jacketed and provided with a large reheater.

Diameter of high-pressure cylinder	25 in.
Diameter of low-pressure cylinder	50 in.
Stroke of both pistons	36 in.
Number of revolutions per minute	160
Piston speed per minute	960 ft.

Shaft to be of hollow, oil-tempered steel, and all of the main forgings to be of the same quality of steel, made very light.

The engine was made condensing because the old engines furnished about all the exhaust steam that can be utilized, and it was made surface-condensing in order to keep the condensing water clean for the purpose of using it in the dye-house instead of the cold river water, as at present, which is heated by exhaust steam. Thus all of the heat rejected by the engine is used in the dye-house quite as effectively as if it had entered the water at that point instead of at the engine, with the advantage that much less steam is required for the power than would be required by a non-condensing engine. There is, moreover, less condensation in the engine and less loss of heat between the engine and dye-house than with the non-condensing engine. All heat that enters the engine goes to the dye-house, except the equivalent of the work done, that lost in the engine by radiation, jacket and reheater condensation, and, of course, that contained in the air-pump discharge. By removing the oil from it the heat in the latter can be saved. The cost of coal for running this engine is therefore very small.

The circulating pump not only sends the water through the condenser, but continues its course to the dye-house. The surface condenser has a combined circulating and air pump, and the whole is made by Worthington. There is also an automatic receiver pump for returning the separator, jackets and re-heater condensations to the boilers, and the exhaust of these auxiliary pumps goes into the exhaust system of the old engines.

It remains to say something more about the details of the engine. The contract was awarded to the Rice & Sargent Engine Co., of Providence, R. I., who are undertaking the work with as much unconcern as they would a slow going engine of well established properties. The engine will have Corliss valves, but the specifications required the low-pressure valves to be worked by positive connections with the eccentrics, and to have a fixed cut-off at one-quarter stroke, capable, by a change when the engine is stopped, of being extended any amount to three-eighths stroke. The valves will be wide open at one-tenth stroke, and the port opening is 12 per cent. of the piston area.

The high-pressure valves only are to be connected with the governor, and dash pots are to be used on this cylinder and will be closed by steam.

The speed of the surface of the shaft journals being great, the bearings were made sufficiently long to reduce the pressure per unit of surface considerably below that occurring in common practice, and ring oiling is to be employed. It may be well to state that in this case the product of journal speed by pressure per unit of surface is far within that common in locomotive driving axle practice.

Electric Traction Under Steam-Railroad Conditions.*

[*Continued from Page* 811.]

Mr. GEO. S. STRONG: As regards the question of the amount of coal necessary to drive a locomotive, Dr. Emery gives 6 lbs. as the average. Mr. Westinghouse has given it as high as 8 lbs. I have tested a number of locomotives that ran as low as 3 lbs. I have a locomotive to-day built, ready to run, on which I will guarantee to give a horse-power for 2 lbs. of coal. I am ready to undertake to build to-day one locomotive or a hundred locomotives and a guarantee a horse-power for 2 lbs. of coal, on the axle or on the drawbar behind the tender. Lately at a meeting of the Railroad Club in this room, this very subject was discussed. A paper by Professor Goss was read on the "Results of High Rates of Combustion in Locomotive Boilers," in which he demonstrated that fully 33 per cent. of the coal in an ordinary locomotive goes out through the stack unconsumed, that is, where the grate area is about 21 ft., and where the rate of combustion is rushed up to 225 lbs. Now our friend here gives us for a branch of the Consolidated road 2.95 as regular consumption for electrical horse-power in the station. That is with one of the best engines. Dr. Emery states in his paper that we cannot expect more than 50 per cent. on the axle of the motor; so that engine must necessarily have used in the neighborhood of 6 lbs. of coal per horse-power developed on the axle. Now to give you an idea of what you have got to contend with in the question of handling trains: One estimate here to-night is 500 H. P. as the average for a train. Now, as much as ten years ago I took a locomotive that I built for the Lehigh Valley road out over the Western roads. On the Northern Pacific we took a 12-car train from a dead stop 10.8 miles in 11 minutes. I indicated the engine myself. She gave a mean effective pressure in the cylinder of 70 lbs. in making 326 revolutions a minute, and indicated 1,810 H. P. on 1.848 sq. ft. of heating surface and 60 sq. ft. of grate area, 30 H. P. per square foot of grate area and nearly a horse-power for every square foot of heating surface in the boiler. That engine, on the Fort Wayne road, took a 10-car train from Fort Wayne to Chicago, making 23 stops and five slow-downs. The running time for the whole distance was one mile per minute. That train weighed, including the engine, over 500 tons. Now when you have to pick up a load of that kind and run with it and stop again, it requires more power than any electric locomotive could give with the same weight. Talk about the weight on the drivers, that engine had all the weight on the drivers she could utilize, and she gave a drawbar pull of 20,000 lbs. An ordinary train does not require to pull more than 1,000 lbs. to the car after it is started, so that 20,000 lbs. adhesion is all any engine can utilize. She would slip her drivers in starting. But by carefully starting, she has all the adhesion she can utilize. That engine pulled up an 86-ft. grade from St. Paul to Minneapolis a 14-car train of cars that weighed on an average 85,000 lbs. a car. The engine itself and tender weighed 100 tons. Now that was a drawbar pull of 23 500 lbs. I took indicator cards, figured the work done on the drawbar and is was 23,500 lbs. pull on the drawbar, which was about one-fourth the weight on the drivers.

Mr. ELIAS E. RIES: The steam locomotive is admittedly quite inefficent as a power producer, using from five to six pounds of coal per horse power developed, whereas by generating the power at properly equipped central stations, using large, efficient stationary dynamos, and evenly loaded stationary compound-condensing engines and all the modern coal and labor saving appliances, the energy can be produced at two or a fraction over two pounds of coal per horse power, besides effecting a considerable saving in labor. The margin of saving in favor of the stationary plant is too great to be ignored, where it can be turned to useful account. Yet there are other features which render it impracticable, *under present traffic conditions*, to operate, electrically, even moderately long-distance steam railways; but am firmly of the opinion that, with the development of higher transmitting electromotive forces and more simple methods of conversion than those which are now practicable to use, we will be in a position to attack the problem of general electric locomotion on trunk-line roads. This will be the case more especially when we have learned how to build our road-beds and track so as to permit of higher speeds with safety than are possible with steam locomotives.

If electric energy generated at power stations is ever to be applied to steam-railroad work for long distances, it is, I believe, necessary that such a system will use high-tension alternating transmitting currents converted at points along the line of way into safe lower-tension operating currents, either alternating or direct, preferably the former, and feed to the locomotives in this converted or lower-tension form.

[Mr. Ries then described at some length his method, as brought out in 1888, of utilizing some of the wasted energy on the elevated roads. He proposed to have one motor car for each train, which would be driven by four electric motors, each geared to its own axle, so as to give a distributed tractive effect. In this car he would have storage batteries to be charged by converting the motors into generators when the train was descending grades, or when coming to a stop at stations, thereby enabling the mechanical energy due to the momentum of the train to be absorbed by the batteries and given out again in the form of useful power when desired. At all other times, the motors would be used to drive the cars and the batteries would be so connected as to give additional current when desired. Mr. Ries said that it had been estimated that of the total power which is developed by a steam locomotive on the Third Avenue Elevated in New York, 83 per cent. is consumed on account of stoppages and grades. He believed that if we could reclaim but one-half of this wasted energy by the method described, it would produce a great saving in cost which could not be accomplished in any other way.]

MR. F. W. DARLINGTON: In connection with transmission on electric roads, two classes of problems have to be solved—ordinary trolley systems operating single light cars—large trolley systems such as the New York Elevated, operating trains with heavier cars—and the regular steam railroads. The difference between the elevated roads and the steam railroads is simply that in the case of the elevated road it is a large trolley road in that it has frequent stops; though not so frequent as on the surface, but still the problem in *measure* is the same. It seems to me that the solution under experiment on the Third Avenue Elevated Road with storage batteries will not produce any results directly applicable to the other problems. On the elevated road the trains are running under momentum part of the time, and part of the time they are accelerating their speed as rapidly as possible. For the conditions existing on the elevated roads it may be possible to charge the storage battery sufficiently during the time of running with momentum to supply the train with all that it will demand at other times. When you come to steam-railroad conditions, however, you have the condition for express trains; that power is put on and stays on during an entire run over a section. Take, for example, the New York and Chicago Limited over the Pennsylvania Railroad; it runs from Philadelphia to Harrisburg without a stop. There they change engines and make another long run, and during the time it is running, if it is supplied from a central power station electrically, the power taken will be practically the same during the whole run. This we have demonstrated on the Burlington & Mt. Holly branch of the Pennsylvania Railroad. They have considerable grades there. We found that the indicator on the ampere meter at starting the train would jump to a certain point and fall gradually while the train makes a run over the entire road—in proportion to the speed at first—but after it gets its maximum speed, the indicator will remain practically constant independent of the grades. This is because the speed is varied on the grades, the train going slower up hill than down, but calling for an even supply of power.

One other thing in connection with the work over there, that applies to the problem of changing over from steam to electricity, is the ability to get up speed rapidly. The road there is 7¾ miles long; the last three-quarters of a mile of it are so-called "yard limits," counting from the Burlington end. The distances are all laid off by mile posts. Starting out from Burlington, in six miles we have obtained a speed of 72 miles

* A topical discussion at the 109th meeting of the American Institute of Electrical Engineers.

an hour and maintained it for three miles, and slowed up again so as to have the train under control, by the time we reached the yard limits, six miles and a quarter. I am confident that no locomotive on that division of the Pennsylvania Railroad can do that with an ordinary light train and on those grades. Another time we started on a two per cent. grade, with a train of cars making the total train load two and a half times what the motors were calculated for, at a point three-quarters of a mile from a mile post, which is located at the top of the grade and then practically level. We made that first mile, from mile post to mile post, at the rate of 48 miles an hour.

Discussion Continued in Chicago, Oct 28.

MR. H. M. BRINKERHOEF: Having run hastily over the various systems that are at present in operation, and using them as a basis for our judgment, let us consider what changes or modifications should be made in them to meet the requirements of surface work.

In the first place, in proposing to install an overhead system we are met by the following objections:

The danger to employees and passengers caused by poles between the tracks. The expense of an overhead construction. The difficulty of maintaining contact at high speeds. In the matter of danger to employees, the fact is that in yards where there are often a complicated set of switches, the presence of poles placed at irregular intervals would be a great menace to trainmen and switchmen in making up trains.

As to the expense of an overhead construction, the difficulty arises in supplying the large starting currents required in this class of service. Not only must the conductor have a large cross-sectional area, but the surface contact with the device on the car must be large to prevent burning at the points of contact. This, of course, means a heavy pole construction, which runs up the first cost.

The difficulty of maintaining contact at high speeds, particularly where crossings must be made, is one which will have to be overcome by some radical departure from present methods, such as the trolley wheel and pole.

Some of the objections to a third-rail system in surface lines are as follows: Danger to employees, particularly in yards, from the bare rail; danger to public at grade crossings; danger to passengers where platforms are used on a level with the track.

In judging of the danger to employees, I think we can get a good basis for an opinion from the experience on the Metropolitan Elevated, which has been operating a third-rail system for more than a year and a half. The work we do in the yards is practically the same as that required on surface lines; switching and making up trains, etc., much of this having to be done quickly and at night. In addition we do such light repair work as is required on the trucks and brakes, removing and replacing brakeshoes, often with the bare contact rails within a few inches of the work. I have looked over our accident reports, which are very complete and include ever mishap, however trifling, and in the time we have been in operation we have had scarcely any men burned or injured by the trolley rail in the yards, and such accidents as have occurred have been of a trivial nature. The danger to the public at the grade crossings could be eliminated by omitting the contact rail at such points, and providing for contact by placing a set of shoes on the passenger coaches and carrying a sufficiently heavy wire through the train to supply the motors as well as the heaters and lights. In this way, such crossings as we have in Chicago, which range from 66 to 80 or 100 ft. in width could be spanned without losing contact. Additional safety could be gained by having a section of the contact rails on either side of the crossing normally out of circuit, and thrown in automatically either by the approaching train or by the guard gates.

The danger to passengers could be best eliminated by elevating the platforms, which would have the additional advantage of shortening the length of stops, and materially improving the service. With our elevated platforms, passengers have no occasion to go upon the tracks, and those who do venture seem to take very great care to avoid the "deadly trolley."

It is hardly necessary to state that to get the maximum economy from an electric installation it would be necessary to change the whole method of handling trains on steam roads by breaking up the train units. This hauling of a large number of smaller trains at more frequent intervals limits us at present to systems having a heavy suburban traffic where such a change would improve the service, besides accomplishing a gain in the economy of operation.

That a system of electric traction can be so installed to meet the requirements of the heaviest suburban service I do not for a moment doubt. As to whether the gain in economy over steam will be sufficient to offset the additional interest charges on the cost of equipment will depend upon the local conditions and the judgment and skill used in equipping to meet those conditions.

MR. M. COSTER: Mr. Brinkerhoff's remarks are very interesting. I will state to you what I think will be the future of the electric locomotive in this country. I think we shall not see, in our time, any electric locomotives applied to cross-country service. They will be used chiefly for suburban service—running light trains at frequent intervals.

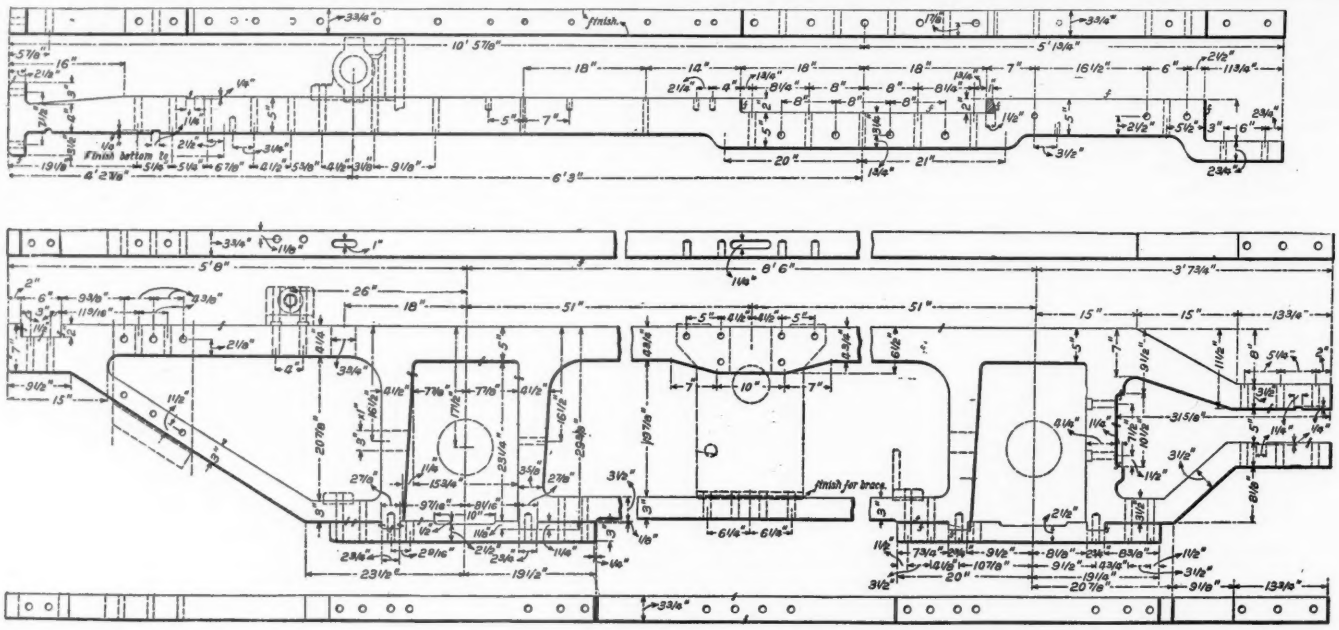
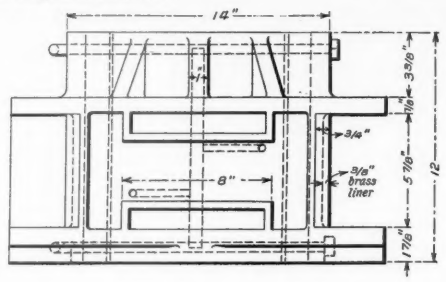


Fig. 1.—Cast-Steel Frame—Chicago, Rock Island & Pacific Locomotive.



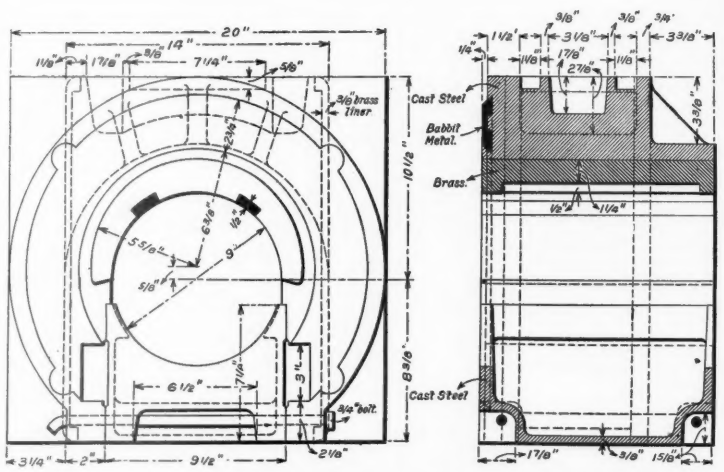


Fig 2.—Cast Steel Driving Box—Chicago, Rock Island & Pacific.

The advantages of the alternating current motor are going to solve the problem. With the polyphase motor, we shall be able to carry high-tension alternating currents over long distances, and change to very low tension for short distances, and so be able to use the third or fourth rail with great success. Thus we could use a very low potential. I look forward to the time in the near future when the alternating-current motor will replace the direct-current motor for street railway work.

MR. BALL: I rather agree with Mr. Coster, in both positions that he takes, that we shall not for the present see the cross country railroads operated by electricity and also that we shall see some developments from the alternating current motor. The great difficulty has been the trouble in obtaining starting torque, and it is a problem which has been worked on for three or four years, but unsuccessfully. The General Electric Company, last spring, announced that they had solved the problem for street railways. Their idea was to put in a condenser to counteract self-induction, changing the capacity of the condenser. This was found impracticable, so they put in an extra self-induction, and varied the frequency. The latter is not simple and is expensive. It is necessary to have the transformer nearly the size of the original machine, that is within 50 per cent. We see that the transmission systems at present are limited to 50 or 75 miles, at a voltage of 15,000 to 20,000. Now, if we wish to transform this into direct current, we would have to put rotary transformers in every 10 or 15 miles perhaps, and transmit at 500 to 700 volts. Reducing the voltage by a static transformer to 500 volts, and putting in a rotary transformer would give you a continuous current at 700 volts. If we have to have a station every 10 miles, and substations every 15 or 20 miles, it is hardly possible to do it with any degree of economy, as compared with steam.

To sum up, the solution for interurban heavy traffic is not found unless it be in the direct conversion of coal into electricity, with some such scheme as Mr. Jacques's battery.

MR. CRAVATH: The only place where we can look forward to any immediate invasion of electricity in the steam railroad field is in suburban service. In order to get the advantages of electricity to the fullest extent for steam railroad work, the steam road must change its methods of operating by cutting up its trains. Trains must be short, not only for the purpose of making the operation economical electrically, as previously mentioned here, but also for the purpose of giving the public better service and more frequent service, especially during the hours of light load, and in that way compete with the street lines. The latter is going to be the very best argument in favor of the use of electricity in the minds of steam road officers who are considering the question.

Suppose the Illinois Central road should decide to adopt electricity for suburban traffic, what would we have to offer them that would perform their service in a satisfactory manner? There is the third-rail system, but we have not decided yet by experiment exactly the best form of third rail or the best position for it, or the best way of insulating and protecting it, or the best arrangement of it for switches, crossings and other special work. That these things will be perfected soon there is no doubt, but we are not there yet. The overhead trolley for such a system as the Illinois Central is considered out of the question, I believe, by the engineers of that road, and they are probably right, because of the large contact necessary for such heavy currents, the difficulties of high speed at overhead switches and trouble from trolley coming off at high speeds on curves, to say nothing of the trouble in switching terminals.

MR. BRINKERHOFF: The highest speed we have ever attained was in a test with a four-car train with four motors. Our ordinary equipment is with two motors. Our longest section is about 8,000 ft. We have attained about 35 miles an hour with a fully loaded train. By "loaded train" I mean a train which was loaded for the test with iron weighing about 14,000 lbs., making an equivalent of 92 passengers in the car. This train made about 35 miles an hour with two motors. With four motors it made about 38½ miles an hour, and the train was still accelerating. With the reduction given three to one I would add another gear of 3⅔ to one. It is merely a matter of gear. The contact shoe is of soft

cast-iron, and when first used seems to wear very rapidly; but after they have been used for a few months they do not seem to wear as fast as they did the first mo th, as they seem to take on a kind of glaze or hardening on the surface.

Mr. COSTER: Both alternating and direct current motors can be made to have any reasonable starting torque. So many people confound the polyphase motor with the synchronous motor. But I want to assure Mr. Ball that we can give him all the starting torque he can use. These motors are now applied with the greatest

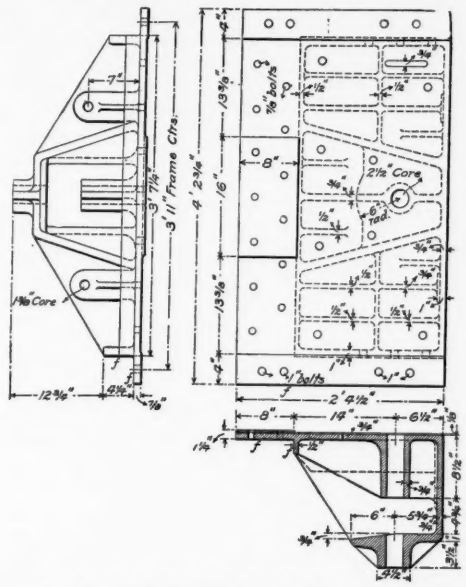


Fig. 3.—Deck Plate—C., R. I & P. Locomotive.

success to cranes in foundries where the work is very exacting—where the mould has to be let down very carefully, and where the crane has to lift a very heavy load and requires a large starting torque.

Mr. BALL: Are you manufacturers in position to put the polyphase motor in the market for street-car work, and if not, what is the difficulty?

Mr. COSTER: In street-car work there are so many details, such as the third rail, controllers, etc. However, the motor is there, and the results have been far in excess of our most sanguine expections. It has excelled the direct-current motor in many respects, and I think the alternating current polyphase motors will be the motors of the future.

Professor STINE: Do you recall any data from the tests made at Pittsburgh on the two-phase street car motor?

Mr. COSTER: I only know they have made some tests very satisfactory results. We are not quite prepared to furnish data, but I will say that I was surprised to see them do so.

Professor STINE: I would like to ask Mr. Rugg if he has any data on hand of their tests?

Mr. RUGG: I have no definite data on hand; except in a general way they are built for heavy torque, and we get between five and six times the static torque, and the controlling of them is easily accomplished. As far as efficiency goes, it compares very favorably with the direct-current street-car motor.

Mr. BALL: Do you put resistance in series with the armature and get it out afterward?

Mr. RUGG: Yes; by means of resistance we get the starting torque.

Professor STINE: The subject under discussion naturally invites attention to the storage battery in relation to the future of electricity in the operation of railways. As the storage battery situation exists at the present time, such a relation seems entirely out of the question, owing not only to the excessive weight of the storage batteries, but to the rapid deterioration of plates, especially when these are made light enough for traction purposes. Some time since I had occasion to make what was to me a very interesting calculation with reference to the possibility of the application of the storage battery on heavy traction work. I was led to do this from results of a purely scientific character, and wish to state emphatically at the outset that this calculation has no commercial basis at present.

Some years ago, during an investigation of the storage battery, I was enabled to obtain an actual storage of one horse-power hour in 29 lbs. of battery. This was under conditions which were far from ideal. By reducing the weight of the containing vessel and dimensions of the battery, and doing away with all unnecessary electrolyte, etc., the same result was indicated from a gross battery weight of 12 lbs. per horse-power hour. This is a laboratory possibility, but unfortunately there are some questions of an electrolytic character which prevent its having any commercial application. On this basis a calculation may be made, showing what would be the result of applying such a battery on the operation of say our best developed express service on railways.

We may assume that the average traction weight on drivers on our best express engines is about 80,000 lbs., while the front truck carries a further weight of 40,000 lbs. Such locomotives are usually provided with great water and coal endurance. We may take these figures at 13,000 lbs. for coal and about 30,000 lbs. for water, this carried on a tender weighing from 30,000 to 40,000 lbs. A locomotive of this size will, at 50 miles per hour, develop about 1,250 H. P., and is in service for about 150 miles at a time. Allowing 50 per cent. reserve, this will give 4½ hours' service, or a total of 5,625-H. P. hours. Counting now 12 lbs. of battery per horse-power hour, we have a net weight of battery of 67,500 lbs. This would seem to be just a little under the average weight of the tender and its contents. Taking the weights of the electric locomotives so far built, it would be possible to carry this entire battery weight on the driving axles, making the total weight tractive, unless for reasons of great speed, when a leading truck would be necessary. The total weight of the battery and locomotive would not be practically in excess of the steam locomotive weight mentioned above (120,000 lbs.). The gain in weight would be that of 80,000 lbs. charged up against the tender.

As to the bulk of this battery, it could be brought within the space at its disposal in such a locomotive. In summing up our figures, we see that practically little would be gained by using the storage battery in place of the steam locomotive, and the entire question would hinge on the economy of such a storage battery installation over that of a portable steam plant. The object, however, was to show the possibility rather than the economy.

To return from the somewhat ideal possibilities to the problem that we are actually facing to-day, I do not believe that the discussion is at all ended, when we have considered the relative economies existing between the practical steam plants and electric locomotives supplied from large central stations. There are many other considerations which will eventually be important factors in deciding to what extent steam railroads will adopt electricity.

In spite of all our carefully matured calculations, bearing on the question of relative economy, should the financial conditions of the country at large greatly improve, these would have less weight than we at present attach to them. The coal item is a comparatively small one on a large and well-managed system, and our assumptions of what would be the character of electric traction, if it were adopted, should be taken with great allowance.

After all, there are questions of desirability which will add weight to those of economy, and experience will suggest modifications from time to time which may put an entirely different aspect on the whole problem. Without being too sanguine, it does seem that if a few engineering points were settled soon, that electric traction would gain a rather rapid hold upon the railroads of the country. At present, electrical engineers themselves are in doubt as to whether polyphase motors have any decided advantage over direct-current motors. Then, too, the matter of contact between the conductors and the moving trains has not reached such a stage of development as to inspire confidence in its reliability and permanence. A few of these points once settled, we may look for rather rapid progress.

Details of Class 22-A, Engines—Chicago, Rock Island & Pacific.

In the *Railroad Gazette*, July 10, 1896, was shown a new 8-wheel passenger locomotive, class 22-A, No. 1101, designed and built by Mr. George F. Wilson, Superintendent of Motive Power and Equipment, Chicago Rock Island & Pacific Railway. This engine has been in regular service for the past six months, during which time it has proved to be very efficient, beside having the record of making the fastest time west of Chicago.

The Chicago, Rock Island & Pacific has recently built two more engines of this class, Nos. 1102 and 1103. These engines differ from No. 1101 only in detail, the general design and principal dimensions being the same as published by us July 10.

In the boilers of the new engines the first cylinder course and connection is one sheet, tapered from the smokebox to the dome sheet.

An important change has been made in the frames. These frames, shown in Fig. 1, are of cast steel and were made by the American Steel Casting Company, of Thurlow, Pa. In the first engine of this class the frame was of hammered iron.

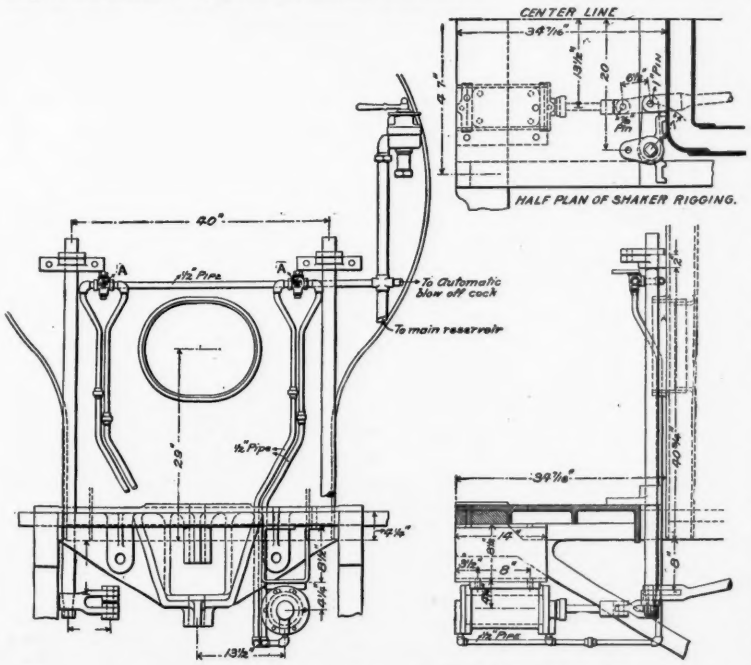


Fig. 5.—Air Grate-Shaker Rigging—C., R. I. & P. Locomotive.

The driving boxes of the new engines (Fig. 2) are of cast steel, with brass rubbing plates against the shoes and babbitt metal on the face of the box against the driving wheel hub. The cast-iron driving boxes of engine No. 1101 are very heavy, each weighing 518 lbs. The steel driving boxes weigh 400 lbs. each.

The cast-iron deck plate for engine No. 1101 is made as light as consistent with safety, the weight being 1,346 lbs., while the steel deck plates for engines Nos. 1102 and 1103 (Fig. 3) weigh 797 lbs., thus reducing the weight by the use of cast steel 549 lbs.

The cast-steel truck center plates (Fig 4) weigh 930 lbs., while the cast-iron center plates of engine No. 1101 weigh 1,561 lbs. The driving wheel centers are also cast steel.

The smokebox fronts of the new engines are of pressed steel, furnished by the Schenectady Locomotive Works

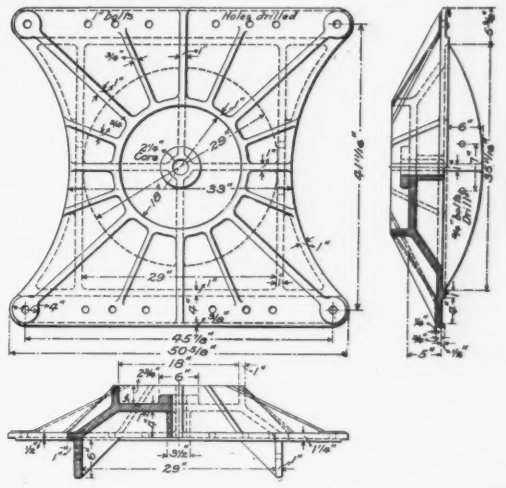


Fig. 4.—Cast-Steel Center Plate—C., R. I & P. Locomotive.

and weigh 416 lbs. each, against 744 lbs. for the cast-iron front of engine No. 1101.

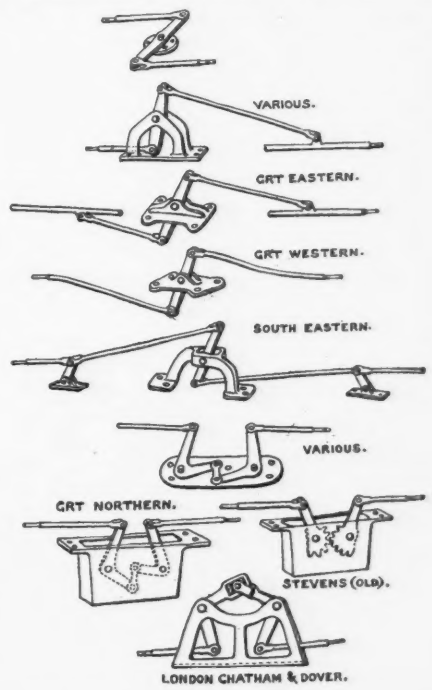
In the new engines malleable iron is used for male center casting and for pilot details, reducing the weight from 795 lbs. to 557 lbs.

The total amount of steel castings used in one engine is 21,573 lbs. All steel castings, with the exception of the frames, were furnished by the Sargent Company, of Chicago. All castings in the tender except the friction plates are malleable iron furnished by the National Malleable Casting Company, of Chicago. McKee-Fuller wheels are used for engine truck and tender. These two engines are equipped with the Leach sanding device.

A new grate shaking arrangement, designed by Mr. Wilson, operated by compressed air, was first used on engine No. 1101 and has also been applied to the later engines. As shown in Fig. 5, a 4¼ in. air-cylinder is connected to each shaker shaft. By means of ¼-in. pipe, the ends of each cylinder are connected to three-way cocks *A*, *A*, which are also connected to the main air reservoir. By operating the three-way cocks by hand, the grates are shaken as desired. Should the air-attachment fail for any cause, the grates can be shaken by means of a wrench on the upright shaft as usual.

English Compensators for Switch Connections.

The engraving herewith shows a variety of automatic compensators for expansion and contraction used on different railroads in England. The sketch is sent to us by Mr. Arthur H. Johnson, who, in connection with the fact that all the sketches show rods of round section,



notes that channel iron with fish-jointed connections is now used by several railroad companies and one signal manufacturer for switch connections. It will be observed that nearly all the levers in these compensators move in a vertical plane. Mr. Johnson reminds us that the designs here shown do not by any means exhaust the variety that may be found in use.

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At 32 Park Place, New York.

EDITORIAL ANNOUNCEMENTS.

Contributions.—*Subscribers and others will materially assist us in making our news accurate and complete they will send us early information of events which take place under their observation, such as changes in railroad officers, organizations and changes of companies in their management, particulars as to the business of the letting, progress and completion of contracts for new works or important improvements of old ones, experiments in the construction of roads and machinery and railroads, and suggestions as to its improvement. Discussions of subjects pertaining to* ALL DEPARTMENTS *of railroad business by men practically acquainted with them are especially desired. Officers will oblige us by forwarding early copies of notices of meetings, elections, appointments, and especially annual reports, some notice of all of which will be published.*

Advertisements.—*We wish it distinctly understood that we will entertain no proposition to publish anything in this journal for pay,* EXCEPT IN THE ADVERTISING COLUMNS. *We give in our editorial columns* OUR OWN *opinions, and those only, and in our news columns present only such matter as we consider interesting, and important to our readers. Those who wish to recommend their inventions, machinery, supplies, financial schemes, etc., to our readers, can do so fully in our advertising columns, but it is useless to ask us to recommend them editorially, either for money or in consideration of advertising patronage.*

The narrow-gage folly seems likely to be quite virulent in England, if we may depend upon the indications visible at the present incipient stage. In consequence of the practically absolute prohibition, up to this year, of all railroads except the most substantial and costly, railroad projects of doubtful wisdom now come forward by the dozen, all at once, and the various schemes proposed embrace all sorts of undigested plans. In England, as everywhere else, the prospect of a grant from the government, like that held out by the provisions of the "Light Railway Act," is a magnet which draws out promotors of every breed. In the matter of gage of track, light railroads have already been proposed, of 3 ft. 10 in., 3 ft 6 in., 3 ft. 3⅜ in. (meter); 3 ft., and 2 ft. 6 in. Some of these lines are, no doubt, entirely detached from all existing railroads, and a capitalist might be pardoned, in such a case, for failing to see the need of uniformity of track, but engineers ought to know better. One projected line of 3 ft. 10 in. gage is explicitly designated as a feeder to a railroad of standard gage. The London *Railway World* very pertinently inquires how much saving is expected to be accomplished by a difference of only 10½ in. width of track, and points out that, as compared with the constant cost of transferring freight, such saving would be inappreciable. Our contemporary's words are commendable, but we must caution it against stopping half-way. Speaking of tracks laid on country roads, the article before us says:

> Few of these roads could spare the width of permanent way required for the standard gage, while the cost of laying a street tramway along country roads sufficiently heavy and paved to carry ordinary wheeled traffic would be prohibitive. The alternative is a half-standard gage railway, 2 ft. 6 in., occupying exclusively a narrow strip of roadway. . . . But it may be well to emphasize the advantage of the narrow gage arising from the fact that deviations from the roadway across the fields will be much less costly than on standard gage.

In opposing diversity of gages the only true position is the radical one. If the cost of pavement is believed to be an obstacle to the construction of cheap standard gage track, we invite our English friends to look at some of the electric tracks on highways in this country; and they will not need to go outside the limits of New York City to see some very cheap ones. It is probable that most country roads in America have more room to spare than is generally the case in England; but it ought to be possible, except in rare instances, to steal from the opposite hedge or ditch enough to allow taking the 27-in. strip additional needed to lay standard gage instead of 30 in. On country roads with but little travel the maximum width is only needed when one wagon meets another.

The Education of Railroad Officers.

Two months ago (September 25, to be exact), we wrote concerning the proposition to establish a college course to educate young men for the vocation of railroading in general. At that time we promised to tell something of the opinions on the proposition which we had collected. Events have delayed the attempt to carry out that promise; and as those who read what we said two months ago will probably have forgotten it, we will recapitulate very briefly.

It is proposed to give a broad and sound four years' course, embracing most of those branches which a candidate for a B. S. would have in all the first-class colleges, and adding the fundamentals of civil and mechanical engineering. It is proposed to add a large range of special study in railroading, covering history, organization and administration; law, accounts and rates; the relations of the railroads to each other and to the State, with the history of associations and commissions. These special railroad studies would be coordinated by a man of actual experience as a railroad officer, and lectures would be given by specialists.

All of this sounds like a good deal of ground to cover in four years, and it is; but those who are considering the subject do not propose to give a merely superficial course of studies, chiefly by unrelated and occasional lectures. They would aim to make a carefully arranged, four years' course, with well-digested courses of lectures, and with recitations on those special topics which it seems most necessary that the higher railroad officer should have a good knowledge of.

The plan is very attractive to the man whose business it is to educate boys, and also to the man who appreciates the enormous importance to society of having railroads well administered; but will the plan work to any useful end? Is the administration of a railroad property a profession or a calling for which a man can be prepared by a set of special studies? Or is it not more like governing a state or a city or carrying on a vast manufacturing and commercial business—something to be prepared for indirectly, by development of the mind and character, and then by the acquisition of that specific knowledge and sound judgment which can only come from actual, responsible work? Do the railroad officers want young men trained as this proposed university course would train them? Or would these young men find that they had been educated for a field which exists only in theory?

In an attempt to get answers to these questions we find a great difference of opinion, which is natural; but we find very little evidence that they have been much thought about by the railroad officers whom we have consulted, which is surprising.

One railroad president sums up the negative side very compactly by saying (in substance) that in the management of railroads there are two classes of questions, questions of exact knowledge and questions of judgment. The first class, the easiest, can be answered by experts trained in the special schools now so good and so numerous. He doubts if a college course, beyond that which is designed to train the mind to think accurately, will help a man to answer the questions of judgment. These ideas are presented in various ways, and at greater or less length in letters before us and in notes of conversations; but it is hardly necessary to expand them; they practically cover the ground of the opposition. We might add that a common notion is that it would be a mistake to divert a boy from a general to a special education at the age at which most boys reach the end of the sophomore year. It is held that the tendency of such early specialization would be toward narrow-mindedness. Furthermore, one general manager of unusual experience and distinction suggests, in addition to the ideas presented above, that any attempt to teach the theory of rate-making would be futile, because rate-making cannot be theoretical. Social conditions differ at different times and places; trade conditions differ; conditions imposed by time, space and competition differ; therefore no theoretical basis of rates can be established and endure.

It has been suggested also that there would be a peculiar, possibly an insurmountable, difficulty in getting teachers. Railroading as an art is still very inexact, as a science it is even less exact, perhaps it must always be so. Whatever is taught about it must in the nature of things be largely matters of opinion or judgment, and it would be as hard to get really mature and useful judgment to teach railroading as it is to get that quality to teach political economy. Indeed, the fear has been expressed that the recruits would come from the very class from which the teachers in political economy are so largely drawn—young men who have been nearly spoiled for useful purposes by the German universities.

Such are the points raised by the opposition, so far as we recall them now. The views of many of those who favor the plan are summed up in the words of a dozen officers, which we do not pretend to quote literally, but will paraphrase freely.

Some of the ablest men in the world are now in charge of railroad properties, are trying to work out their problems conscientiously, but are handicapped by the fact that the ranks are not supplied with men of training and ambition. It is impossible to find enough subordinates with broad intelligence and with trained minds. Some means must be found for developing a class of stronger men, or we might better say a larger class of strong men. A boy aiming to become a general railroad officer "would get the very greatest benefit from a college course such as is outlined in your letter." Such a course "would tend to a higher class of railroad work in future generations." "Young men can no longer get sufficient general knowledge of the various departments of a railroad by going into an office." One president says that he could find places at once for a dozen young men educated on the plan proposed, and others say that they would give them the preference.

We do not propose to try to say the final word in this discussion; we would not if we could, it is too interesting. But we wish to add a few words and then leave the matter with the interested reader for a while.

Of course, we agree with the president, who points out the importance in railroad matters of the questions of judgment, and we may add that all of the most important questions of life are questions of judgment. Men of every profession and occupation have constantly to meet these questions. Every man must face them daily in the conduct of the affairs of his own little family, and it is in dealing with this class of questions that engineers, doctors, lawyers and merchants become eminent. Mere knowledge, however vast or minute, cannot carry a man to a high place; judgment and administrative capacity are what the world pays great prices for. But the fact that only a few engineers, lawyers and doctors can have these higher qualities in a pre-eminent degree has never, so far as we know, been used as a reason why we should cease to give to the mass of men preparing themselves for those professions special training in the exact knowledge required for their practice. It is not probable that the gentlemen who are talking about establishing a railroad course expect to turn out railroad presidents, or general managers or division superintendents, or even section masters or road foremen of engines, prepared either in judgment or in information, to assume at once the responsibilities of those positions; but they would expect to turn out out men whose reasoning faculties have been trained to accuracy and who have learned that the cavity which they carry above their shoulders contains a tool which can be applied to the affairs of life and who have learned to use courageously and efficiently their own powers of analysis and reason. It is doubtless expected, further, that these young men will have acquired not only this confidence in the power of reason, but that at the same time they will have become possessed of a body of special knowledge which will make it easy for them to become railroad presidents and general managers than it would be for a man lacking that training.

There is a favorite pleasantry, often indulged in, about the conceit and the worthlessness for practical affairs of the young man just out of college. In our observation the young man just out of college has less conceit and has a juster and more modest measure of his own value in the world, and at the same time a far greater capacity to make himself valuable, than the young man who has spent the same years at an office desk. We know of few things more hopeless than the conceit of the office-bred clerk. While we have no expectation of mitigating the scorn and irony with which the young collegian is received in the world (nor any hope of it in fact, because we look upon it as a valuable part of his preparation for life) yet we suggest that it is just as well for reasonable men to cease to be led wrong by mere phrases about the effects of college training.

Undoubtedly character is immensely more important than knowledge, for the railroad president or for anyone else in a responsible place, and undoubtedly character cannot be made by books and lectures; but we are not yet convinced that patience, courage, temper and judgment necessarily come to the man who sits on a stool in the fast-freight office, or fires on a locomotive. It may be that a wise scheme of college education gives a short cut to character as well as to knowledge.

There is great force in the contention that an early turning toward a special education is narrowing. But when we consider what a broad and varied profession railroading is that contention loses a good deal of its force as applied to the question of a special education for railroading. Transportation goes to the very roots of modern civilization. A thorough understanding of the relations of railroads to society, from 1830 to 1896, would give a man a broader view and a more solid hold of really vital history and

political economy than one man in five hundred (let us say) ever gets in college. But the course as planned covers much more than this. It would introduce the young men to the law, and surely that gives one broad and accurate ideas; it would carry them some way in the various branches which make up the education of the engineer—the education which, above all others, teaches men intellectual honesty. Surely a scientifically planned preparation for a business so comprehensive as railroading cannot be narrowing.

We shall not stop now to try to answer at length those who fear that the special knowledge imparted in such a course as we are discussing would be of little practical value. Obviously a great deal of experience has been gathered in the two-thirds of a century that men have been building and working railroads, and if even a small part of this experience can be gathered up and imparted to the young men who are starting out as railroad officers, they can start just so much further ahead. The general manager is quite right in saying that they cannot be taught to make rates by rule; but if they could start out knowing this truth and knowing *why* it is true they might save a good deal of time and money. They could not be endowed with ingenuity and judgment in the matter of yards and sidings; but it would be a blessed thing for them to begin active life knowing that great ingenuity and judgment can be applied to yards and sidings, to the glory of the manager and the profit of the stockholder.

But we are disposed to think that the strongest reason for beginning early the systematic education of a lad for the railroad profession is yet to be mentioned. The best thing that we could do for him would be teach him that there is such a profession; or at least to get him saturated with the feeling that the calling of a railroad officer is something to be followed with the professional spirit, whatever name we give to it. It is not worth while to split hairs over definitions. There may be a railroad "profession" or there may not be; the main thing is that the men who manage the railroads should be inspired by that self-sacrifice, that sense of duty, that zeal for the interests of their clients and for the honor of their calling which go to make up what we call the professional spirit. Probably the best way to fill them with this spirit is to subject them while still young to the influence of high-minded men who themselves are inspired by it, and probably that can best be done in college.

The New Master Car Builders' Axle For 80,000-lb. Cars.

(*Concluded from page 792*).

It should now be shown what the Axle Committee has recommended, and the real reason why it has reached the present conclusion.

In the first place it is evident that the Committee has done some very good analytical work, and has made the shape of the axle between hubs on scientific conceptions of the actual conditions of service. In taking the lateral rolling load as sufficient to tip the car as a whole, it has proceeded to the limit and placed that matter beyond criticism. The method of measuring the vertical oscillation by equipping a truck with a measuring apparatus and running it over the Pennsylvania Railroad in actual service is ingenious, interesting and useful in a high degree. It has given data of great value to determine the actual instantaneous stress in axles under normal service. The final dimensions of the axle were determined by Reuleaux's method, using a *calculated* fiber stress of 22,000 lbs. per square inch for that portion of the axle between the wheels. The basis for the selection of this stress is evidently to be found in the following paragraph of the Report:

"Taking the fiber stress *calculated* in this way (Reuleaux's method), it was found that a large number of axles had broken of one design where the fiber stress was 28,000 lbs., these axles having been in service from four to nine years. Where the fiber stress was 23,000 lbs. and less, the records show that axles have been practically free from failure by breaking."

In other words, taking the Reuleaux method of analysis to determine the theoretical stresses of an axle and applying it to axles that are giving good service, such analysis indicates that a repeating and reversing fiber stress of 23,000 lbs. is safe. The misleading thing about this is that most people do not know that the method of analysis followed by the Committee does not give the true reversing and repeated loads, but a theoretical and comparative load which is much higher than the true load, and it is in this that the comparative security from broken axles in existing designs is found. No one familiar with metals would believe that axles in service would stand as well as they do if the actual reversing and repeated load gave a cantinuous fiber stress of 23,000 lbs. for wrought iron, or steel either, for that matter. To get a conviction on this point one need only to stop and think a little about the enormous number of axles of inferior material which have run and continue to run in this country with a *calculated* fiber stress, according to the Committee's methods, of 23,000 lbs. per square inch. Probably the actual stress is less than half that amount.

Now, one naturally inquires, what does the Committee's analysis give? It gives the maximum fiber stress to which an axle will probably be instantaneously subjected on the top side when passing over rough track. It is not clear that there will be any reversal of this load, because it proceeds from a maximum oscillation, of which there may be only one in a hundred miles run, but, of course, with very rough track, there might be more. A true reversing load, however, is another matter. The static load on the journal may be taken as a true reversing load, but the oscillating load is on for an instant only, and the next time it is applied it may not be at a point of the axle opposite where first applied, but at a different point in the circumference.

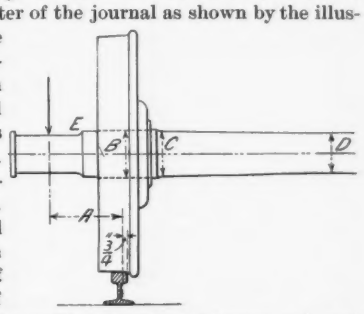
Again, cars do not run fully loaded, and therefore the actual repeated and reversing load must be far less than the assumed. The average actual reversing and repeated loads is probably not over one-half the static load on the journals, and this is the reason why axles stand in service when the common methods of calculation of stresses would show that they could not run for one year without breaking. An important fact is that axles have a chance to rest between the times of maximum loading, and during the quiet period are somewhat restored in strength, according to the well-known properties of metals.

We have only considered the stresses on the axle between the wheel hubs. The stresses outside of the wheels require an entirely different sort of analysis, an important factor of which is the rigidity of the truck frames and the flexibility of the springs after the car is loaded. This is a subject of no small importance in view of the fact that many very rigid trucks are being put into service without a proper increase in the motion of the springs to allow for the loss of flexibility in the truck frames, bolsters and transoms of the car framing. With metal underframes and rigid trucks there may be trouble with axles broken at the journals unless the spring motion is increased. Same consideration of this subject with data as to the flexibility of the trucks and springs was given in the *Railroad Gazette* May 17, 1895, page 315. In view of the attention this subject has attracted, it is interesting to compare the axles in use in foreign countries with the M. C. B. standards. This is done to a limited extent in the accompanying table, which gives the relative strength of several axles, the 4¼-in.×8-in. M. C. B. axle under a 60,000-lb. box car being taken as unity.

The resistance to bending offered by an axle is proportional to the cube of the diameter. If the moments, acting on the two axles, are as 2 to 1 and the cubes of the diameters are as 3 to 1, then the relative strength of the first as compared with the second may be said to be as $\frac{2}{3}$ to 1, since twice the unit load is opposed to three times the ability to resist. Upon this basis the comparison of relative strength has been made.

The weights of box and gondola cars of 60,000 lbs. capacity are taken as 32,000 lbs. and 28,000 lbs. respectively. For the 80,000-lb. refrigerator and gondola cars the weights are those taken by the M. C. B. Committee; namely, 43,600 lbs. for the refrigerator and 35,600 lbs. for the gondola car. The weight of an 80,000-lb. box car is assumed as 37,000 lbs. The loads per journal for foreign axles are those furnished by the railroad officers. In each case the load per journal is that for the car when carrying its rated load, the wheels and axles not being deducted.

In computing the moments the load is assumed to act at the center of the journal as shown by the illustration. The point of contact between the wheel and the rail is taken ¾ in. from the inside of the rail. The horizontal distance from the point of application of the load to the point of contact between rail and wheel is the lever arm *A*, given in the table.



The moment tending to bend that portion of the axle between the wheels is the product of the load on the journal into the lever arm *A*. The moment tending to bend the axle at the neck of the journal is the load multiplied by half the length of the journal. In service, of course, the larger wheels on the foreign axles would cause more stress, but, on the other hand, the service is more severe in this country.

The table gives the dimensions of the axle, the

PARTICULARS OF CERTAIN AXLES IN THE UNITED STATES AND ABROAD.

	Diameter of wheel. Lbs.	Type of axle between hubs of wheels.	Size of journal. Ins.	Diameter of axle. Ins. At B	At C	At D	Distance from center to center of journals. Ins.	Lever-arm, A. Ins.	Rated load per journal, including wheels and axles. Lbs.	Moment between hubs. In.-lbs.	Ratio of moment to moment of M. C. B. 4¼ × 8 in. axle for box car.	Ratio of cube of diameter to cube of diameter of M. C. B., 4¼ × 8 in. axle. At B	At C	At D	Relative strength—M. C. B. 4¼ × 8 in. axle, under 60,000 box car, taken as unity. At B	At C	At D	Ratio of strength at D to strength at C.	Relative strength at neck of Journal—M. C. B. 4¼ × 8 in. Journal under 60,000 box cars, taken as unity.	Ratio of strength at center of axle to strength at neck of Journal.
M. C. B. 4¼ × 8 in axle under 60,000-lb. box car	33	Taper	4¼ × 8	5⅝	5½	4⅝	75	8.5	11.500	97,750	1.600	1.000	1.000	1.000	1 0 0	1.000	1.000	.595	1.000	1.288
" " " " 60,000-lb. gondola car	33	"	4¼ × 8	5⅝	5½	4⅝	75	8.5	11,000	93,500	.957	1.000	1.000	1.000	1 045	1.045	1.045	.595	1.045	1.288
M. C. B. 5 × 9 in. axle under 80,000-lb. refrigerator car	33	"	5 × 9	6⅜	6¼	5⅝	76	9 0	15,150	139,650	1.4.3	1.668	1.381	1.570	1.172	.971	1.103	.676	1.077	1.742
" " " 80,000-lb. box car	33	"	5 × 9	6⅜	6¼	5⅝	76	9 0	14.625	31.625	1.347	1.668	1.381	1.570	1.238	1.025	1.166	.676	1.138	1.242
" " " 80,000-lb. gondola car	33	"	5 × 9	6⅜	6¼	5⅝	76	9.0	14,450	130,050	1.331	1.668	1.381	1.570	1.233	1.038	1.180	.676	1.151	1.242
Axle proposed by Mr. J. A. F. Aspinall under 80,000-lb. refrig'tor car	33	"	4¾ × 10	6½	6⅛	5⅝	77	9.5	15,150	146,780	1.502	1.769	1.651	1.570	1.178	1.099	1.045	.566	.831	1 451
" " " " " 80,000-lb. box car	33	"	4¾ × 10	6½	6⅛	5⅝	77	9.5	14,625	138,940	1 421	1.769	1 651	1.570	1 245	1.162	1.105	.566	.878	1.451
" " " " " 80,000 lb. gondola car	33	"	4¾ × 10	6½	6⅛	5⅝	77	9.5	14.450	137, 70	1.404	1.769	1.651	1.570	1.240	1.176	1.118	.566	.889	1.451
Lancashire & Yorkshire standard axle for 10-ton coal wagon	37±	"	3¾ × 8	5¼	5¼	4½	76	9.0	9 128	87,1·2	.840	.932	.870	.921	1.110	1 036	1.096	649	.865	1.728
" " " " " trader's wagon	37±	"	3¾ × 8	5¼	5¼	4½	78	10.0	8,288	82,880	.848	.932	.870	.921	1.099	1.026	1.086	.629	.954	1.728
North Eastern Ry. of England axle for mineral wagon	37	"	4 × 8	5¼	5⅝	4¾	77	9 5	9,520	90,440	.925	1.071	1.070	1.084	1.158	1.157	1.172	.602	1.007	1.677
" " " " kitchen car	37	"	4 × 10	5½	5¾	4¾	77	9 5	7 635	72,530	.742	1.071	1.070	1.084	1.443	1.442	1.461	.602	1.005	1.677
" " " " first-class dining-car	37	"	4 × 8	5¼	5⅝	4¾	77	9.5	9,184	87,240	.893	1.071	1.070	1.084	1.159	1.198	1.214	.602	1.044	1.677
" " " " third-class dining-car	37	"	4 × 8	5¼	5⅝	4¾	77	9.5	6,902	65,570	.671	1 071	1.070	1.084	1.596	1.595	1.615	.602	1.360	1.677
Paris, Lyons & Mediterranean axle type 10.—Freight service	36.62	"	3.94 × 7.87	6.65	6.02	5.12	76.39	8.9	10,810	96,210	.984	1.894	1.312	1.357	1.925	1.323	1.379	.615	.867	2 192
" " " " 18 " "	36.62	"	3.54 × 7.09	5.91	5.35	4.53	75.79	8.6	7,820	67,250	688	1.329	.920	.940	1·932	1.337	1.367	.607	.959	2 097
" " " " 8 " "	36.62	"	3.35 × 6.69	4 92	4.92	4.33	75 79	8.6	7,820	67,250	.688	.767	.716	.963	1 1 5	1.041	1.313	.881	.861	2.157
" " " " 10.—Passenger service	36.62	"	3.94 × 7.87	6.65	6.02	5.12	76 39	8.9	7,576	67,420	.690	1.894	1.312	1 357	2.748	1.901	1.967	.615	1.230	2.192
" " " " 12 " "	36.62	"	3.94 × 8.66	6.65	6.02	5.12	78.75	0.08	6,888	69,430	.710	1.894	1.312	1.357	2.668	1.848	1.913	615	1.226	2.192
" " " " 18 " "	36.62	"	3.54 × 7.09	5.91	5.35	4.53	75.79	8.6	5,474	47,075	.482	1.329	.920	.940	2.758	1.909	1.951	.607	1.370	2.097
Paris-Orleans axle for freight service	41.34	Straight	3.45 × 6.69	5 51	5.32	5.32	75.59	8 5	10,158	86.350	.883	1.077	.905	1 522	1.220	1.025	1.724	1 000	.724	3.536
" " passenger service	41.34	"	3.45 × 6.69	5.51	5.32	5.32	75.59	8.5	6,852	58.240	.596	1.077	.905	1.522	1.807	1.519	2.554	1 000	1.074	3 536
" " express trains	41.34	"	4.53 × 9.06	6 30	5.71	5.71	76 39	8 9	9,608	85,510	.875	1 610	1.119	1.882	1.840	1.279	2.151	1.000	1.288	2 015
Northern of France axle for freight service	37±	"	4.33 × 7.87	5.91	5.31	5.31	76.78	9 29	11,773	109,380	1 119	1 330	.900	1 513	1 189	.801	1.352	1.000	1.050	1 843
" " " passenger service	37±	"	5.12×10.04	7.09	5.71	5.71	78.75	10.28	9,723	99,940	1.022	2.255	1.119	1 882	2.246	1 095	1.842	1.000	1.654	1.388
" " " baggage and postal	37±	Taper	4.33 × 8.07	5.91	5.31	4.92	76 58	9 19	7,827	71,930	.736	1 330	.900	1.204	1.807	1.223	1 636	.796	1.539	1.466
" " " carriage (and wagon)	37±	"	3.35 × 6.69	5.12	5.04	4.72	75.08	8.44	7,166	64,485	.619	864	.769	1 053	1.39	1.242	1.717	.821	940	2.797
" " " "	37±	Straight	3.94 × 7.87	5.91	5.31	5.31	76.59	9.10	8,708	79,240	.811	1.350	.900	1.513	1.61	1.110	1.866	1.000	1.070	2.449

static load, the static moment, which is uniform between the wheels, and the moment at the neck of the journal. The relative strength is given at four points; in the wheel fit at *B*, next to the wheel hub inside at *C*, in the center at *D*, and at the inner neck of the journal *E*. The table also gives the ratio of the strength at the center to the strength at *C*, and the ratio of the strength at center of axle to the strength at the neck of the journal. One of these serves to bring out the difference in design of that portion of the axle between wheel hubs, and the other to compare the strength of journal with the strength of the axle at the center.

The 5-in. × 9-in. M. C. B. axle was designed for refrigerator cars and bears about the same proportion to the load upon it as the 4½-in. × 8-in. standard under a 60,000-lb. box car.

A proposed axle for American 80,000-lb. cars, sent to the M. C. B. Committee by Mr. J. A. F. Aspinall, of the Lancashire & Yorkshire Railway of England, has the same dimensions at the center as the 5-in. × 9-in. M. C. B. axle, but is larger at *B*. This axle is 1 in. longer from center to center of journals, which makes it somewhat weaker. The standard axles used on the Lancashire & Yorkshire road are about the same strength as the M. C. B. axles. The axles for the North Eastern Railway of England are somewhat stronger than the M. C. B. axles.

In the table are four types from the Paris, Lyons & Mediterranean Railroad. Types 10 and 18, used in freight service, are about 37 per cent. stronger at the center and about 93 per cent. stronger at the wheel hub than the American 4½ in. × 8 in. Type 8, which is much weaker at the hub and neck than the other types, has been discarded because it frequently failed in service, the break occuring in the wheel keyseats.

Five of the seven axles representing the practice of the Paris-Orleans Railroad and the Northern Railroad of France, are straight between the wheel hubs, which makes them much stronger at the center. The taper of the other two is not so great as with the American axles.

Comparing the strength at the center of the axle with the strength at the neck of the journal, it is seen that the foreign axles are all proportionally stronger at the center than the M. C. B. axles. In other words, the foreign axles are stronger at the center in proportion to the static load and are also stronger at the center in proportion to the strength of the journal at the fillet. The foreign axles have larger wheels, but, on the other hand, the service here is much more severe and trying, as the speeds are generally higher, especially for freight cars, and the tracks average rougher, both horizontally and vertically.

Annual Reports.

Baltimore & Ohio.—The last year has been a memorable one with this historic old company. For the first time in its corporate history of 70 years it was compelled to confess insolvency, Receivers being appointed early in March of this year. Since that time a noteworthy change has been effected in all departments of the company's work. In a few months traffic and revenue have been developed to an encouraging degree. The increase in gross earnings in the year to June 30, 1896, was $1,127,000. But the increase in gross in the first four months of the new fiscal year amounts to over $565,000. The progress in improved earnings in a time of extreme depresssion seems to warrant the belief that with an important improvement in general business conditions, even better returns are yet to be made.

The advance already made has been accomplished under many adverse circumstances. But receiverships, while imposing limitations in some directions, where a road under the management of its own directors can move freely, and to better advantage, has its advantages in other ways when those in charge have ability to improve them. Receivers do not have to worry about meeting dividends or fixed charges for one thing. It was essential for the maintenance of the Baltimore & Ohio property—essential even to enable it to conduct its business, that funds which had been used for dividends and like purposes should be expended upon the road. This is made very plain by many facts in this report. Since the Receivers took control they have had to prepare the road and equipment to move the traffic as well as to get the traffic to carry. The management has been very aggressive, and has displayed ability and courage in many ways. The revenues of the company offer evidence of the wisdom of their policy so far as it has been possible to carry it in the brief period since March last.

The most striking work undertaken when the Receivers took control was the overhauling of the rolling stock. This was in very bad condition. We have heard that at one time as many as 5,000 cars were out of service, needing repairs. The motive power was in a similar condition. Practically, all these cars and engines have now been overhauled and put in service.

The report now before usis for the full 12 months to June 30 last, when the fiscal year ended. Four months of the operations under the Receivership are thus included in the report. The general summary of operations for the 12 months presents many interesting facts, and affords opportunity for much more discussion than we can enter upon now. Briefly, there has been an increase in earnings from all items of traffic, the increase in freight being very large, over 1¼ million dollars (7.8 per cent.), and in passenger traffic the increase is $266,000, or 5.2 per cent. In one item, however, there was a decrease. This is in miscellaneous earnings, where the loss is $389,000 (46 per cent.), and is greater than the gain in earnings from passenger, mail and express, so that the increase in gross earnings is $100,000 less than the increase in freight earnings alone, or about $1,128,000.

In view of what has been done since the receivership in restoring the equipment to a serviceable condition, improving the roadbed and in other respects putting the property in condition to conduct economically a much enlarged traffic, it is not at all surprising to notice very heavy increases in the operating expenses. The increase is $1,782,000, altogether, so that the net earnings from the operation of the property show a decrease of 9.33 per cent. The increased charges for maintaining equipment are close upon a million dollars, and 46 per cent. more than in 1895. The report does not present any statement of the monthly earnings and expenses of the property, but the recital of the work which has been done in improvement since the Receivers have taken control, which we shall refer to later on, makes it a safe inference to state that almost all of this increase occurred in the last few months of the year. The increase in transportation accounts is also very large, over $722,000, and is accounted for by an increase of 11 per cent. in the tonnage moved and of 15 per cent. in the ton mileage as well as relatively smaller increases in the passenger movement and mileage.

The income account shows net earnings (not deducting taxes) of $6,361,361. The total available income was $7,330,000. Taxes and interest on bonded debt were $7,202,855. The balance is $127,505. The dividends on preferred stock called for $150,000. The difference between the two items, $22,500, is called the deficit. There seems to us to be some question as to whether it is properly the deficit. It does not include payments on equipment trusts ($588,000), nor the annual payment to the city of Baltimore, on account of the purchase of the Pittsburgh & Connellsville ($40,000), which are surely properly fixed charges. There were other charges, so that it appears the company actually fell short nearly $717,000 in meeting its charges and preferred dividends.

The "other income" of the company shows a loss of $558,000 as compared with 1895. The loss is extraordinary, and calls for some explanation. This is simple, if not entirely complimentary to the bookkeeping methods. An item of about $320,000 was credited in 1895 to this account as a book profit on certain acquired properties. Another item of $140,000 was the profit on bonds sold to pay an old loan. Even as it stands in the present report, this account is open to criticism for its lack of fullness and clearness. The largest single item is entered as "cash received and declared dividends, $461,837," which certainly does not give much information. Still another item, not as explicit as it might be, is "cash received from Sterling main line sinking funds, $179,000." The accounts of the company have long been criticized, and it is unfortunate that the Receivers, who are doing so much to put the property on a stable foundation, could not also have extended their reforms to the accounts as stated in the annual report, publishing statements so clear and full as to contain all requisite information of the company's condition.

The interest account has increased this year by $443,000, accounted for by $300,000 interest on the Baltimore Belt Line bonds, which appears in the balance sheet for the first time; and by an increase of $165,000 in interest on floating debt, this charge calling for $280,000 in the year. The floating debt is stated in the general balance sheet to be $4,895,000, having been increased during the year $876,000. President Cowen states, however, that in addition to this sum the company is responsible for $2,226,000 indebtedness of the Pittsburgh & Western and for $1,300,000 on account of the Baltimore Belt tunnel, for which it holds securities of those companies. The Receivers' certificates outstanding amounted to $4,000,000, bearing six per cent. interest, but only one month's interest on these certificates is included in the interest charges for the current year, so that in the year now begun the fixed charges for the company will be increased about $500,000 on this account and for floating debt, with the probability that the certificates outstanding will be considerably increased during the year

The general results for the 12 months are given below:

Earnings:	1896.	1895.	Inc. or dec.
Freights	$16,818,671	$15.591.062	I. $1,227,609
Passengers	5,315,943	5,049,097	I. 266 816
Mail	727,305	706,603	I. 20,702
Express	613,367	611,737	I. 1,630
Miscellaneous	469,493	858,682	D. 389,188
Total earnings	$23,944,781	$22,817,182	I.$1,127,599
Operating Expenses:			
General expenses	$1.711,200	$1.645,083	I. $66.116
Conducting transportation	9,939,966	9,217.011	I. 722,955
Maintenance of equipment	3,013,204	2,092,716	I. 920,488
Maintenance of way and structures	2,919,049	2 846.232	I. 72,816
Total expenses	$17,583,420	$15,801,043	I $1,782,376
Net earn	$6,361,361	$7,016,138	D. $654,777
Other income	1,068,924	1,627,595	D. 558,670
Total	$7,430,285	$8,643,733	D.$1,213,447
Earnings:	1896.	1895.	Inc. or dec.
Deduct net earn. from Washington Branch	99,926	174,409	D. 74,483
Available income	$7,330,359	$8,469,324	D.$1,138,964
Interest on bonded indebtedness, rentals, taxes and other charges	$7.202,854	$6,759,643	I. $443 211
Balance	$127,505	$1,709,681	D.$1,532,175
Dividends	$150,000	$300,000	D. $1ᶜ0,000
Surplus	*$22,494	$1,409,681	D. $1,432,175
Car Trust payments	$588,777	$663,606	D. $75,829
Payment, account of purchase of the Pittsburgh & Connellsville road	40,000	40,000	.....
Cash appropriations to sinking funds	58,057	58,057	.....
Somerset & Cambria Railroad traffic bonds	13,000	8,500	I. 4,500
Total	$694,834	$770,164	D. $75,329

* Deficit.

Taxes, included in interest and rentals above, amounted to $481,000.

The tonnage increased 11 per cent. and passengers carried 4.38 per cent. Ton mileage was 2,851 *millions*, an increase of 380 millions, or per cent. Passenger mileage was 299.6 *millions*, and increased 11.7 *millions*, or 4 per cent. Neither the ton mile or passenger mile rate is given, nor any other traffic statistics.

The Georgia manager's report summarizes the improvements made during the year and contains a very long and important list of additions in all departments. More than 8,000 tons of new rail have been put in the track and 9,000 tons of partly-worn rail have been taken up and relaid on less important divisions on the lines east of the Ohio River; on the lines west of the Ohio River 3,236 tons of new rail were put down and 1,875 tons of rail relaid; over 1¼ million crossties were placed in the track on both divisions at a cost of $436,000. Twenty-nine miles of sidings were laid, over 575 miles of road were ballasted, 14 bridges and culverts erected, 718 bridges repaired and strengthened, 560,000 ft. of fencing built and 130,000 ft. of platform built and renewed, and nearly 1,200 lin. ft. of trestle filled in with embankments. In addition to this there was a great variety of work in building and repairing new stations, freight houses and shops. Improvements to secure an increase of water supply were made at over 80 points.

During the year 25 locomotives of the Baltimore & Ohio Railroad and eight owned by its subsidiary lines were taken out of service; 435 locomotives received thorough repairs; besides this work an extraordinary amount of ordinary and running repairs were made. All this was done at a cost of $1,238,000 and is included in the operating expenses. The company added 879 cars to its equipment during the year, and 851 coal cars through the Wheelage Car Trust, but put out of service 1,075; in addition 3,505 freight, 40 refrigerator and 313 passenger cars were thoroughly repaired during the year at a cost of $592,000. In addition to all this a number of construction cars were built or bought during the year; 4 postal cars were purchased from the Pullman Company at a cost of $19,000. Vestibules, steam-heating apparatus, air-brakes, couplers and drawbars were applied to passenger and freight cars at a cost of $17,000, and further repairs and improvements made along this line which need not be referred to here. The total number of freight cars in service on June 30, 1896, including those owned by leased lines, car and wheelage trusts, was, 26,440; and passenger cars numbered 684. The number of engines was 857.

The department of physical tests made 11,138 tests against 7,000 the previous year and 2,992 chemical analyses and determinations. Mr. Greene states that the results obtained by this department have been most valuable.

A brief reference is made to the Belt Line tunnel at Baltimore, Mr. Greene stating that a year's use of the tunnel has shown that it fully meets the purpose for which it was constructed. He refrains, however, from making any other reference than may be contained in this sentence to the results of the use of the electric locomotives. The opening of the new passenger station at Bolton Park in the northern part of Baltimore and located on this line, is expected to add materially to the passenger revenue.

Mr. Greene refers to the terminal facilities at Pittsburgh as inadequate and unable to handle economically an ordinary business. Serious and costly delays occur at the slightest increase of traffic on account of the lack of track room. The terminal yard at Locust Point, Baltimore, is also inadequate and he says that the facilities at St. George, Staten Island, are so limited that the movement of New York traffic is seriously delayed. He has submitted plans for improvements at Staten Island and Locust Point, and he urges immediate improvements and enlargements at Pittsburgh also.

In closing his report he recommends the purchase of 75 engines and 5,000 cars, stating that this equipment is necessary to meet the traffic on the lines. It will be remembered that last April, immediately after the appointment of the Receivers, contracts were awarded for building 75 engines and 5,000 cars and practically all this equipment has now been delivered and most of it has been in service for some time. Mr. Green's report, however, is dated Sept. 30, and we are at a loss to infer whether his reference to new equipment stated above refers to these contracts or whether the recommendation he makes is for a still further addition to the company's equipment.

In an address before the National Grange at Washing-

ton, D. C., last week, Interstate Commerce Commissioner Knapp said, among other things:

"One phase of railroad rates especially interesting to farmers is the fact that the rates are divided into classes, some having four or five, and others as many as 12 or 15, and to these classes are applied different prices. The farmer pays on his grain 20, 40 and 50 per cent. of its selling price to get it to market, while the price of the manufactured article is not appreciably enhanced. To move a bushel of grain from Chicago to New York takes 20 per cent. of its price from the farmer, while hats sell in New York and San Francisco at the same price, and the cost for taking a hat across the continent is unappreciable. The hat goes from Danvers, Mass., to New York or San Francisco at a cost so slightly different that it is unapparent; but the cost of transporting a bushel of potatoes a short distance is more than it will sell for. The question which must hereafter be considered is whether the prices should not be lowered on the necessities of life—the products of the farm, the mine and the forest—and raised on manufactured goods. The speaker did not think the roads were receiving too much for their investment of capital and expense, but the question was one of adjustment.

We fear that Commissioner Knapp is comforting the farmers with false hopes. It is no new thing to charge more for carrying costly goods and less for commodities that will not bear the cost of transportation long distances; that is simply the theory of "what the traffic will bear," but there are limits to the theory. We should say that it had been pretty well worked already. The rate on grain from the West to the seaboard has already been reduced by competition to such a low figure that roads with a fair passenger and miscellaneous business seem to submit with considerable complacency when the Chesapeake & Ohio and the Illinois Central's New Orleans line, for example, take grain away from them by making lower rates (these Southern lines being willing to carry grain more miles for less money.) The actual cost of carrying grain cannot be accurately computed, especially if we take into account, as we should, the element of a minimum dividend on the stock of the railroad company, but there is no question that the profit received by the railroads at present for carrying grain is very small. This being so, how much should be added to the price for carrying hats for the purpose of cheapening the grain rate? How large a fund is there to draw from? On the Lake Shore & Michigan Southern last year hats and all other manufactured articles, with merchandise" and everything else not coming under the heads of the usual heavy classes, amounted to only 18 per cent. of the tonnage carried by the road. The last report of the Erie road showed only 13.43 per cent. of these lighter and more costly articles, while coal, coke and grain made up over half of all the freight carried. Many of the articles classed as "merchandise," and which help to make up these small percentages, are looked upon as necessaries of life as much as wheat, and the demand for low prices on them is urgent. The railroads are already charging from three to ten times as much per ton for hats as for grain; so that although this particular article might perhaps bear an increase, everyone opposed to the change would bring up this present wide disparity as a sentimental objection; and that kind of objection often proves as effective as arguments more substantial. And the addition of a very great percentage to the rates on hats (and all other light articles) would provide for only an extremely small reduction in the rate on grain.

One of the marks of a high civilization is said to be the specialization of industries, and in this America can make a pretty fair showing. Brokerage in second-hand pulpits has not yet become a business entirely by itself, and there are not many merchants who deal exclusively in ocean steamships by the dozen in original packages only; but something new is turning up every day and the ultimate possibilities of refinement that our sociologists may yet have to deal with are still in the future. The latest change appears in the announcement of a "combine" known as the "National Association of Car Load Shippers of Eggs, Butter and Poultry." This organization is said to consist of about 200 members representing 13 producing states. It has asked the Joint Traffic Association for a difference in rating between carloads and less than carloads on commodities in which the association is interested. The following reasons are given:

1. That under a carload rating we would forward the full minimum weight required from starting point to destination, to go through without transfer or rehandling.

2. That the outlay of capital in establishing our plants and providing facilities for gathering, handling, storing in cold-storage, and shipping the goods we handle inures greatly to the benefit of the carriers in enabling them to transport the property at a less expense than if shipped in small lots from numerous stations consigned through to Eastern destinations, and entailing upon the carrier the expense incident to rehandling, re-icing, and the various other items well known to railroad men as constituting the difference in cost between handling freight in carloads and less than carloads.

Further arguments are given. We do not know precisely how much weight should be given to the considerations here set forth; it is imaginable that in some respects it would be better for the railroads to encourage small shippers—if, for instance, there were danger that the big shippers, when once well organized, would send their freight all by one road for a time, in order to compel competing lines to reduce rates; but we note the incident as a side-light on the large-car question, discussed in these columns last week. The economy of sending freight in full carloads is still a live question The promise of the chicken-collectors, in their opening paragraph, is definite and business-like. How large a reduction in rates would be necessary to make sure that it would be carried out? The only legitimate argument for a reduction is the difference in cost.

How much should this difference be? If a farmer in Central Iowa sells his butter to a "carload shipper" in Burlington the railroad gets the local rate to Burlington and the carload rate from Burlington to New York or Boston. If the farmer ships direct to New York the total through rate is as low, or lower, but the cost is not materially lower, for the gathering of small shipments into carloads has to be done, all the same, only it is done by the railroad company instead of by the Burlington merchant. The railroad has no right to delay shipments for the purpose of filling refrigerator cars, and so must often send cars through with incomplete loads. The merchant on the other hand, having become owner of the goods, may hold them as long as he pleases, and has provided cold storage houses for the economical handling of his wares; and he can ship always in full car loads. But it is the fashion to make differences between carload and less than carload rates very large, and these shippers will, presumably, want to have the fashion followed in this case, which would be giving them too much. We suggest that the railroads offer them a discount on carloads of about 5 per cent. If the shippers should go to the Interstate Commerce Commission, or to any state railroad commission, we suspect that they would get nothing at all, for the present practice, slightly favorable to the small shipper, will have great attractions for any public official who loves the voter. In fact, we believe that the Interstate Commerce Commission has already had this question before it, and has declined to order a change.

The Pullman Car Company has always given its cars very distinctive names, evidently aiming to rigidly exclude everything commonplace and to use nothing but poetic or classic words, and, of course, only the cream of those. But the exigencies of sordid business will give way for no man, and the demand for extension of facilities has required the building of new cars so fast that it has long been apparent that it was only a question of time when the artist who selects the names would get to the end of his rope. Each new car has borne a more unpronounceable name than its predecessor, and some of these names, in their effort to maintain the elevated social standard of the Pullman Company, have made themselves so coldly dignified as to lean 'tother way, as it were; their severity turning to positive ugliness. We are not yet ready to declare that the search for new names has already run its length, but it must be pretty near the vanishing point, for we read that for three cars lately built for the Iron Mountain road Miss Pullman has selected the following: Dining car, Quantzintecomatzin. Sleepers, Chililitli and Nezahualcoyatl. We suggest for the next one just plain Coyote, to be followed by Yellow Dog.

Under actual conditions, the $8,000 salary attached to each of the three Railroad Commissionerships in the state of New York is a dangerous temptation. According to the political newspaper gossips, the present Governor has got Commissioner Beardsley to resign before the expiration of his term in order to make sure of a Commissionership for his private secretary, Mr. Cole, before a new Governor comes in. The term is five years and $40,000 is a dazzling sum even to some men who ordinarily would be proof against such mercenary considerations. The Constitution of the State of New York requires appointments in the civil service to be made according to merit and fitness, to be ascertained, as far as practicable, by competitive examinations. Can the Governor ignore this in appointing a Railroad Commissioner? Honorably discharged soldiers and sailors are entitled to preference, without regard to their standing on the competitive lists; but how would it be if there were a half dozen good railroad experts to choose from, all old soldiers? We have no doubt the Governor can find such men if he makes inquiry; and the interests of the State demand that he do so.

NEW PUBLICATIONS.

What is Electricity? By Prof. John Trowbridge, Director of the Jefferson Physical Laboratory, Harvard University. New York: D. Appleton & Co., 1896. 7½ × 5 in., pp. 315. Price, $1.50.

To the International Science Series has been added a work which will be read with considerable interest. If those who are anxious to know what conclusions Professor Trowbridge has reached, will read the last chapter, after looking over the preface, they will find that the question, What is Electricity? remains unanswered. We question if this book will satisfy a praiseworthy curiosity; and yet it carries us farther, probably, than any popular work on the same subject. President Trowbridge has endeavored to tell us how electricity *may* be propagated through space, how it is transmitted and some of the phenomena accompanying its manifestation. He discusses almost all phases of the subject, including the latest facts known in regard to the cathode and X rays, and the work is, as a whole, strongly written.

Some of the subjects which are treated do not seem to be in keeping with the general aim of the author, a part of the work being apparently a collection of independent articles. The subject of magnetism, appearing in the third chapter, may confuse some readers, as it may be questioned if we know as much about magnetism as we do about electricity itself. Before we obtain any clear conception of what electricity and magnetism are, we are told that, guided by the great theory of the conservation of energy, we have learned that light, heat, electricity and magnetism are but different manifestations of the same principle and can be studied under one head.

As might be supposed, a large part of the work is taken up with the speculations of physicists on the nature of electrical phenomena, of which Maxwell's electro-magnetic theory of light is the central theme. According to Maxwell's view, the only difference between light, heat and electricity consists in the length of the waves in the propagating medium. That portion of the work which dwells upon this subject should be read carefully, as it leads to many new and almost startling conclusions. For instance, in the opening paragraph of of the preface, the author says: "According to modern ideas the continuance of all life on the earth is due to the electrical energy which we receive from the sun." This is indeed *modern*. While we are aware that such views have been entertained, we did not know that they had been accepted, inasmuch as we still lack the experimental proof of the existence of displacement currents in a non-conductor, which is necessary to confirm Maxwell's assumption.

The author has striven hard to reach a result, but we close the book and still inquire, What is electricity? We ask England's most revered scientist, and his reply is: "I know no more of electric and magnetic force, or of the relation between ether, electricity and ponderable matter or chemical affinity than I knew and tried to teach my students in natural philosophy fifty years ago, in my first sessions as professor." If Lord Kelvin answers thus, what can the ordinary student do? We are learning, however, what electricty can do, which is more essential to the welfare of mankind than to know what it is.

Transactions of the American Street Railway Association; Secretary, E. C. Pennington, 2020 State street, Chicago.

The association is to be congratulated in being able to publish the verbatim report of the St. Louis meeting within a month after its adjournment. Besides the papers read at the meeting and the discussions, lists of the members and all the past and present officers of the association are published. A steel engraving of the past President, Mr. H. M. Littell, appears as a frontispiece. This volume of 214 pages will be a valuable addition to the literature relating to street railroads. Even those not especially interested in the technical part, will find pleasant reading in this volume.

TRADE CATALOGUES.

Modern Methods Applied to the Elevating and Conveying of Materials and the Transmission of Power. By the Link Belt Engineering Co., Nicetown, Philadelphia, Pa., and 49 Dey St., New York.

The catalogue issued by the Link Belt Engineering Co., under the above title, is an octavo book of 130 pages, bound in muslin, with numerous illustrations and price lists and an alphabetical index. Some 20 or more pages in the first part of the volume are given up to illustrations from photographs of plants erected by this company which cover a remarkable variety of service. They show the flask conveyor in the Westinghouse Air Brake Company's foundry, coal and ashes elevators, light package carriers and locomotive coaling stations, coal stocking plants and machinery for distributing newspapers in a publishing office. These in fact are but few of the uses illustrated. The body of the book gives detail illustrations with tables of sizes, capacities and prices of the carriers and other machinery made by this company Into all of this we need not enter because the various systems of conveyors designed and constructed by the company are well known to our readers.

The National Switch & Signal Co., Easton, Pa., has issued a handsome pamphlet describing the two-arm permissive block signal recently designed by the company for use on the "Harlem Line" of the New York Central in Fourth Avenue, New York City. This signal is a semaphore with two arms pivoted on the same spindle, both hanging to the right of the post, so connected that one arm can be pulled down while the other one remains in the horizontal position. The two can also be moved together. By an ingenious arrangement of levers at the bottom of the post this signal can be operated by a single line of pipe worked by one lever in the cabin, although, as arranged on the New York Central, two levers are used.

The National Company has also issued a pamphlet describing the electric train staff. The text and illustrations in this pamphlet are substantially the same as were given in the *Railroad Gazette* of October 9.

The Railroads and Improvements.

Our readers will have noticed in our last two issues a good many news notes, giving information of renewed activity in railroad work, and in those industries closely related to the railroads. The notes below will be found interesting in the same connection. The information published we have obtained directly from the officers of the various companies. The record reflects accurately, so far as can be done now, the tangible effect of the election on railroad business in the opinion of those in responsible control of a number of the most important

companies. The opinions vary a good deal, as might have been expected. Some companies feel warranted in taking up important work; others look for the improvement to come a little later, and others again believe that the railroads which they manage will not be materially affected, for a long time. All are confident that the hopes of better business are well founded It will be noted, however, that some of the conservative men call attention to the fact that a patient with a desperate disease recovers slowly.

The very satisfactory earnings on the Illinois Central and the Yazoo & Mississippi Valley during the year ended June 30, 1896, as shown in the Illinois Central report for that year, and the returns made by the Receivers of the Chesapeake, Ohio & Southwestern, which passed into the control of the Illinois Central on Aug. 1, have justified the company in keeping its men regularly employed in the shops, and quite generally on full time. This has enabled the company to go into the winter with motive power and rolling stock in better order than ever before. It is not expected, therefore, to increase the working hours in shops or the number of men employed. During the present calendar year the company has purchased for the three railroads abovenamed 43,923 of new rails, and this is all that will be done in this line at present. Little new bridge work is likely to be done, but during the coming year the replacing of the old iron bridge across the Illinois River at La Salle, with a new steel structure, calculated to carry the heavy engines and cars now in use, will be undertaken. It has also been concluded to further increase the standard of bridges, with a view, during the life of those hereafter to be built, of introducing engines weighing 100 tons, and cars capable of carrying 50 tons of freight. The last annual report shows that, traffic having been heavier during the year ended June 30, 1896, than in any previous year, 2,000 additional new freight cars and 45 new engines were purchased in the year, and 23 other new engines were contracted for, and these are now being delivered. Since the election two more locomotives have been bought and bids for 1,000 box cars are now out. These last will somewhat more than replace the usual "mortality" in freight cars during the current fiscal year.

President Ripley, of the Atchison, Topeka & Santa Fe, writes: We shall be very glad to increase the working hours at our shops and the number of men employed when the business warrants it; at present it does not. It is our intention to continue our improvements in track and bridge work, but we see no indications now that any addition to our rolling stock will be necessary. It is true that a general feeling of confidence pervades the business community, and that the surface indications are in favor of a fairly good business for the next 12 months. It is also true that there is a large amount of grain on our lines in sight and which will probably be moved during the ensuing six or eight months, but we have ample equipment for such business as is likely to offer, and beyond our ordinary renewals and certain improvements to roadbed and track which are already provided for, I do not anticipate any extraordinary improvement.

The Chesapeake & Ohio has not only increased the forces at all shops since election, but has placed some of the departments on ten hours' as against nine hours' time. During the depression a policy of keeping track and bridges in first-class condition was maintained, therefore any considerable expenditures for track material or bridge work are not anticipated until spring. The company will, however, lay six miles of 100-lb. rail and 12 miles of 75-lb. rail during the coming month. The officers anticipate an increase in business, and have kept up the rolling stock during the depression, building new cars in every instance to take the place of those destroyed. Orders have been placed for 200 additional coal cars with the Ensign Manufacturing Co., at Huntington, W. Va. It is also contemplated to purchase six consolidation freight engines.

The Cleveland, Cincinnati, Chicago & St. Louis has increased the working hours at its shops and is taking on more men. The officers expect a large increase of business, and that the company will be short of rolling stock. Some cars and engines will be purchased.

The officers of the Fall Brook Railway Company, from present appearances, do not think that they will increase the working hours of the shops or the number of men employed. The shops are working five days a week, and part of the time six, and have been for the past year. The company may order two passenger locomotives in place of four old ones dismantled, but it will not be necessary to procure these before April or May delivery.

The Baltimore & Ohio has been working its shops on full time for the last 60 days and it is not contemplated to increase the hours or the number of men employed, as a full complement is being worked. There are no plans on foot at present for any considerable expenditures for track material or bridge work. The contracts for all the bridge work that will be done this winter have been let and the track material that was needed to improve the road has nearly all been laid. Within the past 60 days, 150 miles of 85-lb. rail has been put in the track between the Ohio River and Baltimore and several bridges are in process of erection. The viaduct at Seneca, on the Metropolitan Branch, which cost about $30,000, is about completed. The new bridge at Moundsville, W. Va., costing about $25,000, is well under way. The Receivers anticipate an increase of business, which will require additions to the rolling stock, but feel able, with the present equipment, to take care of such business as is now being offered. It will be remembered that the Baltimore & Ohio Railroad, in April, ordered 75 locomotives and 5,000 cars. All but 16 of these locomotives are in service on the road and all of the cars have been delivered. The equipment which was found in bad order has mostly been repaired and is again in service and it is estimated now, that but 5.5 per cent. is in bad order. This is being repaired as rapidly as the capacity of the shops will admit.

The Chicago, Rock Island & Pacific officers do not expect, for the present at least, to increase either the working hours at shops or the number of men employed. The company's business does not warrant any such increases at the present time. The company has during all the period of depression fully maintained tracks and bridges in every respect, and no extraordinary expenditures are now necessary on this account.

The Receivers of the Norfolk & Western hav been working full time at their shops for over a year, and the present officers contemplate no reduction in working hours or in the number of men employed. The Receivers have made large expenditures for track material and bridge work, and the new company will not make any considerable expenditures on this account until next spring. The company's business has already increased, and still further increase is anticipated, but no addition to the rolling stock will be required at present or in the near future.

The Atlantic & Pacific has increased the working hours of its shops to full time, and as soon as the increase of business which is anticipated warrants, will also increase the number of men. Within the past few days the Receiver has contracted quite largely for new rails, frogs and switches and purposes increasing orders for new ties very materially, all of which would not have been done had the result of the election been reversed. The present outlook is decidedly favorable to a large increase in the movement of traffic of all kinds, and, it is believed, will be so great as to compel a material increase in rolling stock.

The Chicago & Alton does not expect to increase either the working hours of its shops nor to increase the number of men employed, but rather will work less hours and employ less men than last summer. In fact, orders have already been given discharging a considerable number of men and putting the shops at Bloomington, Ill., and other places on shorter hours. The officers expect, however, an increase in traffic movement when the winter is over.

The Columbus, Hocking Valley & Toledo, on Nov. 8, increased the working hours at its shops 37 per cent. and slightly increased the number of men employed. It is not contemplated to make any considerable expenditures for track material or bridge work An order, just placed for 50 new dump cars of large capacity, is the only new equipment to be built.

The Pennsylvania, on its lines west of Pittsburgh, has increased the hours of work in its car-repair shops from 45 to 60 hours a week, and has employed about 150 additional men, but otherwise no changes have been made.

The Boston & Maine did not materially suspend work during the recent stringency, but kept its usual forces at work, believing that the depression and the falling off in its income was only temporary, and for that reason it has not been found necessary to increase either the time of the men in the shops or on construction work.

The West Shore has not taken any action beyond increasing the work in its various shops to full time instead of eight hours, the time they have been making for the past two or three months.

The Delaware & Hudson Canal Co. has increased the time at its shops, but has no special work in contemplation. Six new engines have just been purchased, and about March orders will be placed for additional equipment.

The Lake Erie & Western has kept its shops open during the summer on full time with the usual number of men employed in the shops. Rather extensive improvements in track and bridge work are proposed, and there will also be considerable additions to the equipment. No details of this work can be given at the present time, and they are in fact part of the general plan for the improvement of the road.

The officers of the Wisconsin Central, while looking for a material improvement in its business, have not yet noticed any special movement in its traffic to warrant any extensive new work. As the traffic improves certain changes and improvements will be undertaken and additional equipment will also be purchased.

The improvements on the New York, New Haven & Hartford were not materially affected by the loss in income, which was noticeable during the summer, and the company has no special work which it is proposed now to undertake beyond what has been going on for a long time past in the way of four-tracking, eliminating grade crossings and the new station at Boston. The officers look forward, however, to a considerable increase in business, resulting from the reopening of the manufacturing industries on its line, which have been idle or but partially operated.

The *Northwestern Lumberman*, discussing the present attitude of car builders toward lumber dealers, says:

Since election the car building industry seems to have failed to revive as some expected. The demand for sills, decking sides and roofing is scarcely as good as it was before election. One of the big factories at Detroit has this week shut down for lack of orders. This comes like a surprise to those who believed and proclaimed that after election there would be a boom in all industries, including car building.

But there is a reason for the present condition of the car-building industry—several reasons, in fact. All through the period of depression the shops were run at little or no profit, and since July at a loss in most cases. The railroads have profited by this, for thus they have secured a lot of cheap cars. Now that sound money and prosperity have been indorsed by the votes of the people, the operators of car factories naturally want some benefit out of it. They propose to take no more contracts at the old losing figures. but will make their bids so as to see some profit in them. The railroads are not prepared to accept such bids just yet. The year's end is near, and settlements must be made. The railroads are in a waiting attitude, and will probably postpone the placing of contracts for new equipment until early next year. Yet it is said that there is a large amount of figuring going on, which doubtless is for the purpose of keeping in touch with the market and learning any changes that may take place. . . . But the roads will have to be provided with many new cars within the coming year, and those conversant with railroad matters confidently predict a revival of demand for car lumber within a few months.

TECHNICAL.

Manufacturing and Business.

The Michigan Malleable Iron Co. of Detroit, Mich., which has been operated with a reduced force, is now employing about 300 men, about 150 having been added since the first of the month.

The Berlin Iron Bridge Co. is putting up a new machine and blacksmith shop for a shipbuilding company at Noank, Conn., and is furnishing a rolling mill for the Rome Brass & Copper Company, of Rome, N. Y., an iron roof for the new armory at Rutherford, N. J., and a new electric power house at Plattsburgh, N. Y.

The co-partnership heretofore existing as G. W. G. Ferris & Co., consisting of G. W. G. Ferris, J. C. Hallsted and D. W. McNaugher, doing business at No. 813 Hamilton Building, Pittsburgh, Pa., was dissolved on Nov. 11, 1896, by mutual consent, G. W. G. Ferris retiring. The business of the concern will be carried on by J. C. Hallsted and D. W. McNaugher, under the firm name of Hallsted & McNaugher.

The shop departments. the busheling furnaces and the muck rolls of the Western Tube Co., which employs nearly 3,000 men, were put in operation on Nov. 16.

A. A. Goodrich & Co., of Detroit, Mich., have received an order for 2,000 tons of charcoal pig iron for Budapest, Hungary. The iron is required for the manufacture of car wheels.

The Rand Drill Co. has recently put a duplex compound air compressor in the shops of the St. Paul & Duluth at Gladstone, Minn., and has recently received orders for compound air compressors from the Chicago, Rock Island & Pacific and the Great Northern.

One of the engines of the Chicago, Rock Island & Pacific was recently equipped with a National electric headlight and the results have been so satisfactory that a second engine is now being similarly equipped. The manufacturers of the headlight have recently increased their factory force and are running the shops night and day to fill orders received since the election.

At a meeting of the Board of Directors of the Michigan Peninsular Car Company, the regular dividend of 2 per cent. on the preferred stock, due Dec. 1 next, was passed, and the following resolution was adopted: "That a dividend of 1 per cent. on preferred stock be declared, payable Nov. 27 to stock of record Nov. 23. This payment is to apply on the preferred cumulative dividend, No. 7, which was passed."

The Pullman Palace Car Co. has added about 300 men to its shop forces at Pullman, Ill., in the last few weeks, but is reported to have reduced wages 15 per cent. It is further stated that the company is strictly enforcing the requirement that shop employees live in the town of Pullman.

The bridge over Berry's Creek on the Erie road, described on page 819 of this issue, has been painted with two coats of Smith's durable metal coating, made by Edward Smith & Co., 45 Broadway, New York City.

The King Bridge Co., of Cleveland, O., has been awarded the contract for putting in a 60-ft. iron turntable for the Vandalia Line at Terre Haute, Ind.

A charter has been granted to the Casey Improved Signal Lantern Co., of Philadelpha, capital $50,000, to manufacture an improved signal lantern for use on railroads and steamships. John T. Casey is President.

Iron and Steel.

The South Works of the Illinois Steel Co., at South Chicago, Ill., are to resume operations early in December.

The Ashland Steel Co.'s plant, Ashland, Ky., employing 150 men, resumed operations on Nov. 16.

The foundry department of the West Superior Iron & Steel Co., at West Superior, Wis., has been put in operation by the receiver.

Hannah furnace of the Mahoning Valley Iron Co. has been blown in recently. The furnace has been idle for some time, during which it has been relined and the engines almost entirely rebuilt. Other minor repairs and changes have been made.

The Ohio Iron Co.'s furnaces and rolling mills in Zanesville, O., shut down on Nov. 23. Lack of orders is given as the reason for the stoppage.

The Baltimore & Ohio Southwestern has contracted

with the Carnegie Steel Co. for 7,000 tons of rails, weighing 75 lbs. to the yard, for immediate delivery.

The Cleveland Steel Co. proposes to make additions to its plant and to begin the manufacture of open-hearth and crucible steel. For this purpose the capital stock of the company has been increased from $300,000 to $500,000. The new buildings and furnaces are now being built, and it is expected that they will be finished by Jan. 1.

New Stations and Shops.

The Gulf, Colorado & Santa Fe proposes to build a brick passenger station at Dallas, Tex., and the surveys and plans for the work are now being prepared.

The Galveston Wharf Co. is to build another grain elevator at Galveston to accommodate the large grain traffic now reaching that port.

The Vandalia has in process of construction, at East St. Louis, an inbound freight-house 60 ft. × 578 ft. Jas. Stewart & Co., of St. Louis, are the contractors.

General Manager W. M. Greene, of the Baltimore & Ohio, has announced that bids will be let at once for the erection of the company's repair shops at Keyser, W. Va., which that town has secured by raising a bonus of $10,000. The shops, which will employ 200 men, will be 90 ft. × 500 ft. in dimensions and will have a glass roof.

The report that the car and paint shops of the Lehigh Valley, now at South Easton, will be moved to Packerton, Pa., proves to be unfounded.

Interlocking.

The National Switch & Signal Co., of Easton, Pa., has been awarded the contract for installing the interlocking plant at Hammond, Ind., on the Hammond & Blue Island. This machine will require 216 levers, and will be the largest machine in the United States.

The Berlin Electric Railroad.

The first work on the elevated electric city railroad in Berlin, which the famous electricians, Siemens & Halske, are to build, was done Sept. 10. The foundations for the pillars, each 3 × 2.60 meters on the surface, and on the average 3.50 meters deep (9 ft. 10 in. × 8 ft. 6 in. × 11 ft. 6 in.), and containing 10 cubic meters of masonry laid in cement, will be left to settle over winter before the pillars are erected on them. The two lines of foundations are 11 ft. 6 in. apart, and stand at intervals of 16.5 meters (54 ft. 2 in.) in each line.

Lake Street Elevated Locomotives to be Sold.

The Lake Street Elevated, Chicago, ran the first trains over the new structure in Wabash avenue Sunday morning, Nov. 8, enabling the road to carry passengers as far south as Adams street. The operation of this road by electricity has been found so satisfactory that it is the intention to dispose off all the locomotives used prior to the change. These locomotives are of the Forney type, standard gage, and weigh 56,500 lbs. The cylinders are 18 in. and 21 in. diameter by 18-in. stroke, and the drivers are 44 in.

Rail Shipments to Japan.

Joseph U. Crawford, Engineer of Branch Lines of the Pennsylvania Railroad, who was recently appointed representative of the Imperial Railroads of Japan, for the purchase of 15,000 tons of steel rails and fastenings from the Carnegie Steel Co., Pittsburgh, Pa., reports that shipments of the material are now being made to Yokohama. A contract with the Carnegie Co. has been closed by Freight Agent John H. McAdoo, of the Great Northern, to ship 6,500 tons of rails and fastenings from Pittsburgh to Yokohama, the shipment going via Cleveland, Northern Steamship Co., Great Northern Railroad from Duluth, and its steamship line, the Nippon Yusen Kaisha, from Seattle to Yokohama.

New Lake Vessels.

The Chicago Shipbuilding Co. has received contracts to build three new steel vessels, two steamers and a tow barge, the total cost of which will be about $400,000. The steamers are to be built for R. R. Rhodes, of Cleveland; they will be 240 ft. long by 42 ft. beam, with a molded depth of 24 ft. The engines will be triple expansion. The tow barge, which will be built for the Elphicke-Orr syndicate, will be a duplicate of the barge Aurania. It will be 352 ft. long on the keel, 44 ft. beam and 26 ft. molded depth. The three vessels are all expected to be completed by June 1, 1897.

A steel ship 400 ft long, of the same model as the Queen City and the Zenith City, is to be built for A. B. Wolvin and others, of Duluth, who own both those vessels [and one other, now under construction. The two mentioned are the largest carriers on the Great Lakes, and the new one is to equal them. It will be built in Chicago. Contracts for other vessels have been made as follows: a steel steamer for Capt. Thos. Wilson and others, to cost $240,000; a steel barge for the Globe Iron Works Co., owner's account, to cost about $50,000; a steamer for O. W. Blodget, Bay City, to cost $120,000; two steel oil tank barges for the Standard Oil Co. These contracts will be carried out at six of the lake yards.

New Vessels for the Merchants' Transportation Co.

The Merchants & Miners' Transportation Co., which operates a line of steamships between Norfolk, Va., and Providence, R. I., has contracted with Harlan & Hollingsworth Co., of Wilmington, Del., for a new steamship. The new vessel is to be an exact duplicate of the Howard, one of the company's present boats, built last year by the same company which has just been given the new contract, and is to be completed within 12 months at a cost of $330,000. It is to be of steel throughout, 270 ft. between perpendiculars, and 203 ft. over all on deck; molded beam, 42 ft.; depth, 34 ft., and will have 6 ft. 6 in. sheer forward. The speed will be 15 knots.

The Nail Association Dissolved.

It was reported this week in a newspaper announcement, which, apparently, was issued authoritively, at least in part, that the Wire Nail Trust, which has been in operation in the United Ttates and Canada since June 1, 1895, will wind up its affairs Dec. 1. The advance of 15 cts. per keg ordered by the trust at its March meeting in this city resulted in a great curtailment of the demand, and in turn forced the trust to close up 90 per cent. of its mills. In order to reduce the output the entire sales of nails by the trust mills during July were but 30,000 kegs, and in August but 25,000 kegs, though the output agreed upon for those months was 60,000 and 55,000 kegs respectively.

The Navy Yard Dry-Dock Accident.

Secretary Herbert has approved the findings of the court of inquiry appointed to investigate the accident which occurred at the Brooklyn Navy Yard last August, when the caisson of dry dock No. 2 left its groove, and allowed the outside water to rush into the dock, carrying with it the Ericsson, the Commandant's barge, several scows and floats, and some lumber. The Ericsson struck forward, and her bows were badly stove in, so that her forward compartment finally filled with water. She was carried out of the dock by the refluent wave and remained in the entrance. The Commandant's barge sank to the bottom of the dock, and the caisson lay on its side a short distance within the entrance. The inrush of water set up a current, or suction, in the Wallabout, which parted most of the fasts of the Puritan and Terror, and one of those of the Atlanta.

The court states in its report that about May 1, 1896 the Naval Constructor, F. T. Bowles, made a recommendation of certain repairs necessary to be made to the caisson of dry dock No. 2. This called for the removal of part of the loose stone ballast in the caisson. Civil Engineer A. G. Menocal had charge of the work, and he made calculations to satisfy himself of the safety of doing the work as he proposed. Mr. Bowles, who was asked for his professional opinion on the subject, assured Mr. Menocal that it was perfectly safe. By the calculations made by Mr. Menocal, there was a margin of safety of about 200 tons after removing the stone ballast from the caisson, but there was no precedent to fix that amount as sufficient under all conditions of tide and weather. The Naval Constructor's letter, authorizing the work, called for the removal of a portion of the stone ballast, yet Mr. Menocal removed it all. Mr. Menocal, who practically left the yard on Friday at noon, was relieved by Civil Engineer U. S. G. White. While Mr. White knew of the condition of the caisson at the time, still, when he was absolutely in charge, he did not admit any water ballast, although he knew that the caisson was to remain in place until Monday. And in spite of the fact that Mr. White considered the manner of performing the work unsafe, he not only did not admit water ballast, but failed to report his suspicions to the proper authority.

Trial by general court martial was recommended in the case of Mr. Menocal and Mr. White. Secretary Herbert declined to court martial the officers, but reprimanded them as being responsible for the accident.

Contracts for Gun Forgings Awarded.

The Navy Department on Nov. 10 awarded contracts for eight sets of 13-in. rifle forgings to the Bethlehem Iron Co., deliveries to commence in 120 days and to be completed in 365 days; also for six sets of 13-in. rifle forgings and one set of 12-in. forgings to the Midvale Steel Co., of Nicetown, Pa., deliveries to commence in 160 days and to be completed in 340 days. The bids of both these companies were at 23⅛ cents per pound.

Launch of North German Steamship Bremen.

The new twin-screw steamship Bremen, of the North German Lloyd Steamship Co., was launched on Nov. 14, from the yards of F. Schichau, at Dantzig, Germany. The Bremen is one of four boats now being built by the North German Lloyd, which are known as the Barbarossa class. She is 525 ft. long between perpendiculars, and 550 ft. over all; beam, 60 ft.; depth, 34 ft.; tonnage, 10,000 tons register and 20,000 tons displacement; draft, 28 ft., and cargo space, including steerage decks, 388,500 cu. ft. The cabins accommodate 100 first-class and 76 second-class passengers The two engines are quadruple expansion, of 8,000 indicated H. P., giving a speed of 15 knots.

A 10-in. Gun Tested.

On Nov. 17 a successful test was made of one of the two 10-in. disappearing guns at the fort at Willetts Point, N. Y. Five shots in all were made, the last three with 248 lbs. of powder each. These shots were directed a little to the south of Execution Lighthouse, where they dropped. The projectiles carried about six miles, at a velocity of 2,014 ft. per second. The tests were satisfactory to Capt. W. A. Crozier, under whose direction they were made.

Twin-Screw Savannah Steamship.

The new Savannah line steamship La Grande Duchesse, which has recently been completed at the Newport News shipyard, will make her first trip from New York to Savannah on Nov. 28. She is the only twin-screw steamship of the Savannah fleet. Her two sets of quadruple-expansion engines will develop about 7,000 H. P. She is 404 ft. long, 47 ft. 9 in. beam, and 37 ft. 4 in. deep. She has been designed for use as a government cruiser in case of emergency.

THE SCRAP HEAP.

Notes.

The railroads of New England have agreed not to demand releases on bicycles carried in baggage cars.

The Interstate Commerce Commission has filed suits in Ohio against three minor railroad companies to compel them to file annual reports, as ordered by the Commission, acting under the Interstate Commerce Law.

The city of Port Huron, Mich., has adopted Central Standard time, and turned the official clocks back 28 minutes. We congratulate Port Huron; she is only a trifle over 13 years behind time.

One of the persons injured in the show collision on the Missouri, Kansas & Texas Railway in Texas last September sued the railroad company and has recovered $500. It is said that judgment was entered against the company "by arrangement."

A press dispatch from St. Paul says that the Great Northern, the Wisconsin Central and other roads have been indicted for refusing to turn over unclaimed freight to a public warehouseman after 20 days. It appears that this claim is made under a law lately passed, which seems to have been intended to aid the warehouseman in making a living.

The Fall Brook Railway has established emergency hospitals at its principal stations. The outfit consists of four ounce bottles each of chloroform and ether; one and one-half yards of adhesive plaster, one pound of absorbent cotton, a box of bandages, two packages of iodoform gauze, a bottle of antiseptic tablets, a pint of whiskey, a pair of blankets, a cake of castile soap and a cot.

The Baltimore & Ohio is doing some good work with its new Baldwin passenger engines. On Nov. 15, train 507 (the Chicago Limited), with engine 1308, hauling 11 cars, the entire train, with the exception of three cars, being vestibuled, left Baltimore at 7:04 p. m. and arrived in Washington at 7:52 p. m., 40 miles in 48 minutes (50 miles an hour). This train covered the distance between Muirkirk and Alexandria Junction, 8.1 miles, in seven minutes (69.4 miles an hour). The speed had to be slow through the cities of Baltimore and Washington, and there was one slow order on account of sewer construction.

The New York Central conductors, station agents and trainmen have donned their new winter uniforms. The conductors' and agents' uniforms, in addition to the brass buttons, shoulder strap and cap number, have on the sleeve a gilt band for every five years the wearer has been in the employ of the company. Station Master A. B. Raser carries four stripes. Conductor Coates has the banner uniform on this division with eight stripes; Conductor Rockwell wears three, and Conductor Evans will bear five, if not six.—*Utica Herald.*

Storage Batteries in Railroad Work.

The President of the Electric Storage Battery Co. of Philadelphia has printed the following information from the *Accumulatoren-Fabrik Aktiengesellschaft*, of Hagen, Westphalia:

"In Hanover there is a mixed system which consists in a combination of trolley and storage batteries, the cars being all equipped with storage batteries, which are charged, while running, from the trolley poles outside of the city limits sufficiently to carry the cars without the aid of the trolley within those limits. On this mixed system there are now in operation 60 cars equipped with our batteries, and in addition there are to be installed 80 by next spring.

"In Dresden 30 cars are running to-day; 15 additional to be furnished on another line of the same place in a few months; all running on the mixed system.

"In Copenhagen we are going to install 18 cars for some lines of the street railway of that city; all these cars to be in operation in the beginning of January next. The system is the pure storage battery system.

"In Hagen eight cars are now in operation, and 10 additional are to be equipped in the near future.

"In Ludwigshafen two street cars with our batteries are new in operation, and two large railroad cars have been ordered by the government of Wurttemberg to be operated near the same place.

"In Paris we are going to equip 35 cars on some lines of the Compagnie du Nord.

"In Berlin the city government has decided to run on all the lines of the city storage battery cars on the mixed system, the outer lines to be equipped with trolley. This matter has been somewhat delayed, as other companies have applied for building new lines in competition with the old street-railway company of Berlin, and those applications are now taken into consideration by the city government, which, however, does not change the decision in favor of storage batteries, the underground conduit having been done away with entirely. In Berlin at least 600 to 700 cars will be run by storage batteries.

"Finally, we will beg to mention a most successful experiment which has been carried out by our house in Vienna, Austria, on a railroad line in Arad, Hungaria, the experiments being inaugurated by the Hungarian Government. A storage-battery railroad car has been run with a speed of 75 km. over a track of 40 km. a few weeks ago and the trips have been continued since without any trouble at all."

All of this is extremely interesting, but we do not undertake to guarantee that it is entirely free from the rosey color which the promoter can throw over the most matter-of-fact statements.

Where Railroads Are Worked by the State.

L'Evénement asserts that a complete reign of terror exists among the employees on the Intercolonial Railway and that dismissals are being made every day. It cites the case of one discharged employee who went to the member for his county to complain about being dis-

charged, and asserts that the M. P. told him that he should be satisfied with having been 15 years in the Government employ, and that he should now make room for another. But its most serious charge is that Mr. Blair is not dismissing as many employees in the Maritime Provinces as in Quebec, and that the "guillotine" works most actively among French Canadians.—*Montreal Herald.*

The Pursuit of Happiness by the Aid of Machinery.

The railway brotherhoods of the country are holding a covention in Chicago to consider what legislation they want from Congress and the best way to obtain it. Will this be legislation for the "classes" or the "masses"? It is demanded by men who were appealed to in the late campaign as the "masses," but who, in their present undertaking, undeniably form a class. The incident plainly shows the folly of trying to make a hard and fast distinction between masses and classes in this country. The men who made the masses as contra-distinguished from a certain class, are themselves a class as contra-distinguished from the population in general. Nobody pretends that the legislation to be asked for will be in the interests of the whole people. It will be class legislation.—*Public Ledger, Philadelphia.*

The Pacific Mail Steamship Co.

At a meeting of the Directors of the Pacific Mail Steamship Co., held in New York, on Nov. 19, a semi-annual dividend of one per cent., payable Dec. 1, 1897, was declared. Authority was given to President C. P. Huntington to invite tenders for building a new ship of 6,000 or 7,000 tons, with a speed of 16 knots or more, to be used in the China trade.

A Charitable View.

The Buffalo Board of Aldermen has laid upon the table an ordinance of the Board of Health forbidding expectoration upon the sidewalks, on the floors of public buildings and hotels, and in street and railway cars. Doubtless the Aldermen regard expectoration as an inalienable right. It appears to be so regarded in this town. Nobody pays any respect to the notices of the Board of Health forbidding the offense in the cars. The most accomplished expectorators are the guards on the elevated roads, but the conductors on the surface roads are a good second. All over the city the barbarous abomination goes on, day and night. One who watches the offenders is almost tempted to believe that not only are they unaware that they are committing an offense against good health, good manners, decency, and civilization, but that they do not even know that they are doing anything. They expectorate involuntarily, or for want of thought, as if they whistled. Yet it costs nothing to predict that by the twenty-first century expectoration will be punished severely by all the criminal courts.—*The Sun*, New York.

The Philadelphia Subway Loan Awarded.

Mayor Warwick, of Philadelphia, has awarded the $1,500,000 four per cent. subway loan of the city to Drexel & Company, of Philadelphia, and Harvey Fisk & Sons, of New York. The joint bid of these firms for the entire amount was $101,299. The loan is a portion of $6,000,000 which will be expended in the construction of the Reading Railroad subway. The city authorized a loan of this amount for the work, and the Reading Company will redeem half of the principal and pay half of the interest.

English Regulations for "Horseless Carriages."

The Local Government Board has published an order dealing with the regulation of motor cars. In the order, a motor car, or "light locomotive," is defined as a "vehicle propelled by mechanical power which is under three tons in weight unladen, and is not used for the purpose of drawing more than one vehicle (such vehicle, with its locomotive, not exceeding in weight, unladen, four tons), and so constructed that no smoke or visible vapor is emitted therefrom, except in temporary or exceptional circumstances." If a car exceeds 3 cwt. in weight it must travel either forward or backward, and it must not exceed 7½ ft. in width. If a car weighs between three quarters and one ton the tires must not be less than 2½ in. wide; if between one and two tons, 3 in.; and if between two and three tons, 4 in. There must be no bosses or projections on tires except in the case of pneumatic tires, when there may be bosses or projections of the same material as the tires. Every car must be provided with two independent brakes in good working order, able, at 14 miles an hour, to stop within a distance of 50 ft. The car must be driven by a competent person. Lamps must be carried at night, and the driver shall, whenever necessary, give audible and sufficient warning of the approach and position of the car by sounding a bell or by other sufficient means. The driver must also, on the request of any police constable or any person having charge of a restive horse, or on any such constable or person putting up his hand as a signal for that purpose, cause the car to stop and to remain stationary so long as may be reasonably necessary. The law provides that motor cars shall not be driven along the public highways at a greater speed than 74 miles an hour. The Board may require a lower rate, but no action has yet been taken on this point.—*The (London) Railway News.*

Lake Notes.

Iron-ore shipments from the Gogebic Range for the season have closed with a total of 1,550,000 tons, about 800,000 tons less than last year, and about half the range's highest record.

Lake navigation will close in about a week, when some very interesting figures can be given for the year. Ice is already quite heavy on the upper lakes, and ore shipments are carried on under great difficulty. Much wheat is going forward from Duluth for export and will continue to the last possible moment, and freights are higher than for months, there being many cargoes to be had at 3 cts. a bushel, or $1 a ton.

The advantages of the deeper lake draft on the lakes was exemplified this week by the steamer Queen City, which loaded at Duluth 177,000 bu. of grain for Buffalo. She was the first vessel to load for the deeper cut at Sailor's Encampment, which has been a shallow spot below the canal in St. Mary's River, heretofore limiting vessels in the Superior trade to from 14 or 14.5 ft. She loaded to 15.5 ft., though the new draft is a foot more, and took down 5,196 tons, the largest cargo ever carried on the lakes. The new cut increases the capacity of the new 400-ft. class of lake ships about 15 per cent., or from about 4,000 tons gross of ore, to 4,600. By it freights are permanently lowered. When the full depth of 20 ft. is attained, next year, these same vessels will be carrying not less than 7,000 tons.

The Bessemer Steamship Co. has let the contract for a tow barge of steel, 380 ft. long and 400 tons capacity on 15 ft., to the Globe Iron Works Co., of Cleveland, for about $145,000. The vessel will be out in May.

One of the Davidson wood ships, built this summer, was launched this week. The boat is 285 ft. keel length, 43.5-ft. beam and cost about $200,000. She will not go into trade till 1897. Two large tugs are on the Davidson stocks, but will not be put into the water until November.

Plans are under way at Detroit for two side-wheel ships for the Richelieu & Ontario Navigation Co., a Canadian passenger company operating on Lake Ontario and the St. Lawrence. They are to be about the finest passenger ships on the lower lake, and are to be about 300 ft. long. They will probably be out in time for next year's excursion business.

A Fifteen-Inch-Gage Railroad.

The Duke of Westminster has just completed on his Eaton estate a narrow-gage railway, connecting the hall with the Great Western Railway at Balderton, three miles distant. The total length of the line laid is 4¼ miles, which includes, besides the main line, a branch three-quarters of a mile in length to the estate works near Pulford, together with several shorter branches, to the estate brickyard and other points. The traffic to be dealt with, consisting chiefly of coal, road metal and building materials, was computed at about 5,000 tons per annum. As it was desired that the line should be inconspicuous, since it had to cross the park and the three principal drives, and as the required capacity was small, it was decided to adopt a gage of only 15 in. The line is laid with steel flat-bottomed rails weighing 16½ lbs. per yard, and to reduce repairs to a minimum, these are carried throughout on cast-iron sleepers 3 ft. long 6½ in. wide, weighing 28 lbs. each, and coated with an anti-corrosive. Steel spring keys secure the rails in jaws cast on the sleepers, which are spaced at 2 ft. 3 in. centers, and at the joints at 1 ft. 4 in. Steel girders on cast-iron foundation plates are used for all the bridge work. Thus no timber whatever is employed in the permanent way, and the depreciation is practically limited to wear of rails. The entire cost of construction has been £1,095 per mile, or with rolling stock, £1,309 per mile. The annual expenses are computed at £642. With the estimated traffic of 5,000 tons per annum over an average distance of 2½ miles—equal to 12,500 ton-miles—the cost of carriage is almost precisely 1s. per ton per mile, materially less than the cost of cart haulage.—*Herapath's Journal (London).*

LOCOMOTIVE BUILDING.

The Chesapeake & Ohio proposes to purchase six consolidation freight engines.

CAR BUILDING.

The Columbus, Hocking Valley & Toledo has ordered 50 dump cars of large capacity.

The Atlantic & Pacific is likely to increase its equipment, but the question is still undecided, and orders will not be given out for a long time.

The Receivers of the Wisconsin Central received forma authority from the United States Court last week to purchase the 1,000 freight cars which are reported to be already contracted for.

The St. Louis & San Francisco will be in the market shortly for from 300 to 400 coal cars. The matter, however, has not yet been definitely decided upon. Recently the company has purchased 100 furniture cars and 50 refrigerator cars.

Contracts are to be given out shortly for 1,000 cars for one of the private lines operating over the Baltimore & Ohio Railroad. The equipment will be built on Baltimore & Ohio specifications. The matter is in the control of Mr. W. M. Greene, General Manager of the Baltimore & Ohio.

The Lebanon Mfg. Co., of Lebanon, Pa., is just completing an order of 500 hopper-bottom gondola cars of 60,000 lbs. capacity for the Philadelphia & Reading. These cars are equipped with Fox solid pressed steel trucks, Schoen pressed steel body bolsters, National hollow brake beams, Gould couplers and Westinghouse air brakes. The last of the order will be delivered this week.

BRIDGE BUILDING.

Asheville, N. C.—The Commissioners of Buncombe County have ordered a low-truss iron bridge to be built over Flat Creek on the public dirt road, 11 miles from here. Two other bridges will also be built in this county during the present winter, viz., one over the French Broad and another over the Ivey River. The contract for one of these has already been awarded to the Converse Bridge Co., of Chattanooga.

Atchison, Kan.—Bids are asked until Jan. 5 for rebuilding two county bridges. C. H. Krebs is County Clerk.

Bradford, Pa.—Councils have asked the City Engineer to furnish an estimate of the cost of building a bridge on the proposed extension of Washington street.

Buffalo, N. Y.—Bids will be received until Dec. 2, for the superstructure and postbents of the Chicago street viaduct, together with the approach in Exchange street connecting with the viaduct. Prices are required for each span and approach separately, and for the whole work. Edward B. Guthrie, Chief Engineer, Bureau of Engineering.

The contract for the grade crossing viaduct on Chicago street has been given to Christopher Smith for $78,000.

Chicago, Ill.—A contract which calls for the construction of 68 bridges, the work on which is to commence early in the spring, has been let by the engineering department of the Santa Fe to the American Bridge Works, of this place. Eleven of the 68 bridges are to be iron through bridges, 41 iron girder bridges, and 16 iron eye-beam span bridges. The majority of the 68 bridges are to be built on the Chicago division of the road at points between Kansas City and Chicago.

Downey, Cal.—The bid of the Excelsior Bridge Co. of $1,305 for a bridge across the Old San Gabriel River on the Los Angeles and Whittier road has been accepted.

Green Bay, Wis.—It is stated that the time for receiving bids for the rebuilding of the Main street bridge, mentioned in our issue of last week, has been extended from Nov. 27 to Dec. 4.

Menominee, Mich.—The City Council has accepted plans and specifications for a new steel bridge to connect with Marinette, the estimated cost of which is $9,500. Iron piling will be used, and the bridge will be similar to the one recently erected by Marinette.

New Haven, Conn.—It is stated that the city has been ordered to build the proposed bridge over the New York, New Haven & Hartford at East Chapel street, at once.

New York.—The Executive Committee of the East River Bridge Commission has examined Engineer L. L. Buck's plans for the foundations for the Brooklyn tower of the new bridge. The plans for the north foundation fix the datum plane at 96 ft. below mean high water, and for the south foundation 82 ft. below the same level.

The Commissioners made a requisition to Mayor Wurster, of Brooklyn, and to Mayor Strong, of this city, for $1,000,000 from each city, payable before July, 1897.

Norfolk, Va.—At the last meeting of the City Council it was ordered that a contract be made for an iron and steel bridge across the Elizabeth River between Norfolk and Atlantic City Ward. An appropriation of $10,000 was made some time ago, but delay has been experienced in obtaining the right of way over certain property belonging to the Norfolk & Western, which, however, has now been granted, and work will begin as early as possible.

Philadelphia, Pa.—Councils' Survey Committee asked the Finance Committee to provide $400,000 for the proposed new Grav's Ferry bridge in next year's appropriation. Favorable consideration has also been given to an amendment to the ordinance authorizing the opening of Rhawn street, which permits the Pennsylvania Railroad to build a bridge across Rhawn street in lieu of a bridge at Hartel street.

Pittsburgh, Pa.—In the construction of its extension from Millvale to Bowerstown, the Consolidated Traction Co. will change a number of bridges in Millvale and build several new iron structures.

Woonsocket, R. I.—It is stated that the Youngstown (O.) Bridge Co., has been given the contract for the new steel bridge over the river. The bids ranged from about $12,000 to about $16,500.

MEETINGS AND ANNOUNCEMENTS.

Dividends.

Dividends on the capital stocks of railroad companies have been declared as follows:

Boston & Maine, quarterly, 1½ per cent., payable Jan. 1.

Stockholders' Meetings.

Meetings of the stockholders of railroad companies will be held as follows:

Rome, Watertown & Ogdensburg, annual, Central Trust Co., New York, Dec. 28.

Savannah, Florida & Western, annual, Savannah, Ga., Nov. 24.

Sunbury & Lewistown, special, Betz Building, Philadelphia, Pa., Dec. 1.

Technical Meetings.

Meetings and conventions of railroad associations and technical societies will be held as follows:

The *Railway Signalling Club* will meet on the second Tuesday of the months of January, March, May, September and November, in Chicago.

The *Western Railway Club* meets in Chicago on the third Tuesday of each month, at 2 p. m.

The *New York Railroad Club* meets at 12 West Thirty-first street, New York City, on the third Thursday in each month, at 8 p. m.

The *New England Railroad Club* meets at Wesleyan Hall, Bromfield street, Boston, Mass., on the second Tuesday of each month.

The *Central Railway Club* meets at the Hotel Iroquois, Buffalo, N. Y., on the second Friday of January, March, May, September and November, at 2 p. m.

The *Southern and Southwestern Railway Club* meets at the Kimball House, Atlanta, Ga., on the third Thursday in January, April, August and November.

The *Northwestern Railroad Club* meets at the Ryan Hotel, St. Paul, on the second Tuesday of each month, at 8 p. m.

The *Northwestern Track and Bridge Association* meets at the St. Paul Union Station on the Friday following the second Wednesday of March, June, September and December, at 2.30 p. m.

The *American Society of Civil Engineers* meets at the House of the Society, 127 East Twenty-third street, New York, on the first and third Wednesdays in each month, at 8 p. m.

The *Western Society of Engineers* meets in its rooms on the first Wednesday of each month, at 8 p. m., to hear reports, and for the reading and discussion of papers. The headquarters of the Society are at 1736–1739 Monadnock Block, Chicago.

The *Engineers' Club of Philadelphia* meets at the House of the Club, 1122 Girard street, Philadelphia, on the first and third Saturdays of each month, at 8 p. m., except during July and August.

The *Denver Society of Civil Engineers* meets at 3 Jacobson Block, Denver, Col., on the second Tuesday of each month except during July and August.

The *Montana Society of Civil Engineers* meets at Helena, Mont., on the third Saturday in each month, at 7.30 p. m.

The *Engineers' Club of Minneapolis* meets in the Public Library Building, Minneapolis, Minn., on the first Thursday in each month.

The *Canadian Society of Civil Engineers* meets at its rooms, 112 Mansfield street, Montreal, P. Q., every alternate Thursday, at 8 p. m.

The *Civil Engineers' Club of Cleveland* meets in the Case Library Building, Cleveland, O., on the second Tuesday in each month, at 8 p. m. Semi-monthly meetings are held on the fourth Tuesday of each month.

The *Engineers' Club of Cincinnati* meets at the rooms of the Literary Club, No. 24 West Fourth street, Cincinnati, O., on the third Thursday in each month, at 7.30 p. m. Address P. O. Box 333.

The *Engineers' and Architects' Club of Louisville* meets in the Norton Building, Fourth avenue and Jefferson street, on the second Thursday each month at 8 p. m.

The *Western Foundrymen's Association* meets in the Great Northern Hotel, Chicago, on the third Wednesday of each month. S. T. Johnston, Monadnock Block, Chicago, is secretary.

The *Engineers' Club of Columbus, (O.)*, meets at 12½ North High street, on the first and third Saturdays from September to June.

The *Engineers' and Architects' Association of Southern California* meets each third Wednesday of the month in the Hall of the Chamber of Commerce, Los Angeles, Cal.

The *Engineers' Society of Western New York* holds regular meetings the first Monday in each month, except in the months of July and August, at the Buffalo Library Building.

The *Civil Engineers' Society of St. Paul*, meets on the first Monday of each month, except June, July, August and September.

The *Engineers' Society of Western New York* meets on the first Monday of each month at the Society's rooms in the Buffalo Library.

The *Boston Society of Civil Engineers* meets at 715 Tremont Temple, Boston, on the third Wednesday in each month, at 7:30 p. m.

The *Engineers' Club of St. Louis* meets in the Missouri Historical Society Building, corner Sixteenth street and Lucas place, St. Louis, on the first and third Wednesdays in each month.

The *Engineering Association of the South* meets on the second Thursday in each month, at 8 p. m. The Association headquarters are at The Cumberland Publishing House, Nashville, Tenn.

The *Engineers' Society of Western Pennsylvania* meets at 410 Penn avenue, Pittsburgh, Pa., on the third Tuesday in each month, at 7:30 p. m.

The *Technical Society of the Pacific Coast* meets at its rooms in the Academy of Sciences Building, 819 Market street, San Francisco, Cal., on the first Friday in each month, at 8 p. m.

The *Association of Engineers of Virginia* holds informal meetings on the third Wednesday of each month from September to May, inclusive, at 710 Terry Building Roanoke, at 8 p. m.

The Railway Signal Club.

A meeting of the Railway Signal Club was held Tuesday, Nov. 24, at the Great Northern Hotel, Chicago. The subject discussed was the "Interlocking Plant at Hartford, Conn."

Western Foundrymen's Association.

A regular meeting of the association was held at the Great Northern Hotel, Chicago, on Nov. 18. A discussion took place on the report of the Committee on Apprenticeship. There was also a discussion of some of the association's series of topical questions.

Connecticut Street Railway Association.

At the annual meeting of the Connecticut Street Railway Association held in New Haven, on Nov. 19, the following officers were elected for the ensuing year: President, H. Holton Wood, Derby; Vice-President, Henry S. Parmelee, New Haven; Secretary, E. S. Breed, New Britain; Treasurer, E. S. Goodrich, Hartford. Executive Committee: A. M. Young, Waterbury; Israel Kelsey and G. A. W. Dodge of New Haven.

Chicago Electrical Association.

The Chicago Electrical Association met Friday evening, Nov. 20, at Room 1737 Monadnock Block, Chicago. Mr. E. L. Andrews, Engineer for the American Telephone & Telegraph Co., presented a paper entitled, "Daily Problems in Long Distance Telephony." The discussion was lead by Mr. Kempster B. Miller, of the Western Telephone Construction Co. Various topics were brought up for discussion by Mr. H. G. Dimick.

Western Society of Engineers.

At the meeting of the Western Society of Engineers on Nov. 18, the Board of Directors reported eight applications for membership. A vote of thanks was given the Entertainment Committee, the Chicago, Rock Island & Pacific Railway officials, Col. A. R. Buffington, Col. Wm. R. King, Capt. L. L. Wheeler and Mr. C. E. Schauffler, for courtesies shown the society on the trip to Rock Island, mentioned in the *Railroad Gazette*, Nov. 13. The next "Journal" of the Society is now ready for distribution.

St Louis Railway Club.

The next regular meeting of the St. Louis Railway Club will be held in the parlors of the Southern Hotel, on Friday, Dec. 11, 1896, at 3 o'clock, p. m. There will be open for discussion the paper entitled "Increasing Locomotive Mileage by Lengthening of Runs," which was presented at the meeting of Nov. 13 by C. W. Eckerson, M. M., C. B. & Q. Ry., Beardstown, Ill., and also for discussion the paper presented at the same meeting, entitled "The Mechanical Properties of Wrought Iron and Steel, as Shown by Actual Tests," by Prof. J. B. Johnson. In addition to the discussion of these papers there will be presented a paper entitled "The Pooling of Freight Car Equipment," by Jos. R. Cavanagh, Supt. Car Service, C. C. C. & St. L. Ry., Indianapolis, Ind.

Engineers' Society of Western Pennsylvania.

A regular meeting of the society was held in Pittsburgh on Nov. 17. A paper on "Inclined Plane Railways" was read by Mr. Samuel Diescher. The paper reviewed the various types of inclined planes engaged in the transportation of commodities, teams and passengers, their respective modes of operation, efficiency, hoisting plants, drums, safety apparatus and safety ropes; also appliances for the control of operation and for the prevention of accidents; wire ropes, their composition, durability, strength, causes and effects of wear; history of a particular set of wire ropes in service on a team-inclined plane; tests of original wires, of finished new rope; record of gradual deterioration of that rope, and test of same rope after having been thrown out of service on account of advanced wear.

Engineers' Club of St. Louis.

The club met Nov. 18, Vice-President Flad in the chair, 22 members and four visitors present. Mr. Carl Barth gave an informal talk on the Emery Testing Machine, in the development of which he took a prominent part. Mr. Barth exhibited a number of lantern slides, showing the general appearance of the machine and its most important details. Brief discussion followed, participated in by Messrs. Freeman, Harrington, Baier and Russell.

Prof. J. B. Johnson showed the club a new form of cement briquette, which he had designed with a view of securing more accurate results in cement testing. He showed wherein the ordinary form of briquette was imperfect, and gave the theoretical considerations governing his design, and the results it has given in practice.

PERSONAL.

—Mr. James A. Davis has been appointed Industrial Commissioner of the Atchison, Topeka & Santa Fe.

—Mr. Horace G. Allen has been appointed a member of the Boston Rapid Transit Commission to succeed Mr. A. C. Burrage, resigned.

—Mr. John Wigton has been appointed Master Car Builder of the Missouri, Kansas & Texas lines north of Denison, with office at Sedalia, Mo.

—Mr. W. M. Brehm has been appointed Master Mechanic of the Missouri, Kansas & Texas lines north of Denison, with office at Parsons, Kan.

—Mr. G. W. Martin has been appointed General Agent of the St. Louis & San Francisco, for Colorado, Utah, Arizona, New Mexico, Idaho, Wyoming and Nevada, with headquarters at Denver.

—Mr. George L. Bradbury, Vice-President and General Manager of the Lake Erie & Western and Fort Wayne, Cincinnati & Louisville roads, has opened an office at Chicago and will have his principal headquarters in that city.

—Mr. R. H. Organ, General Storekeeper for the Butte, Anaconda & Pacific, has resigned his position and goes to Montreal to administer the estate of his deceased brothers. Mr. William Wood, formerly clerk, will succeed him.

—Mr. D. H. Hillman has been appointed General Southern Agent of the Chicago & Eastern Illinois and of the Evansville & Terre Haute, to succeed Mr. J. M. Cutler, now General Freight Agent of the Georgia Southern & Florida.

—Mr. Peter Arp, connected with the Panhandle shops at Dennison, O., has been appointed Superintendent of the erecting shops of the Vandalia Line, at Terre Haute, to succeed Mr. Frank Morehead, who has resigned to go to the Louisville, Evansville & St. Louis shops in Princeton, Ind.

—Mr. S. G. Eddy, of Denison, Tex., formerly General Manager of the line now the Choctaw, Oklahoma & Gulf road, and also at one time Division Superintendent of the Missouri, Kansas & Texas, has been stricken with paralysis and is not expected to recover. Recently he has been interested in a railroad project in Arkansas.

—The vacancies in the Board of Rapid Transit Commissioners of New York City, created by the resignation of Mr. Seth Low and the death of Mr. John H. Inman, were filled by the Commissioners last week by the election of Messrs. George L. Rives and Woodbury Langdon. Mr. Rives is a member of an important legal firm of New York City, and Mr. Langdon is one of the most prominent business men of the city, a member of a large drygoods firm, and a trustee or director in many financial and commercial companies.

—Mr. G. W. G. Ferris died in the Mercy Hospital, Pittsburgh, Pa., Nov. 22. He had been in the hospital a week ill with typhoid fever. Mr. Ferris had been for some years known to engineers and to makers of bridge and structural steel as the head of the inspecting and testing firm of G. W. G. Ferris & Co. In 1893 he became known to the world as the designer and promoter of the Ferris wheel, which was one of the remarkable features of the Columbian World's Fair, and which has been imitated in the "Gigantic" wheel in London.

Mr. Ferris was a graduate of the Rensselaer Polytechnic Institute about 1880, and had considerable practice, especially in testing and inspecting. Notice of his retirement from the firm reached us last week and appears elsewhere in this issue.

ELECTIONS AND APPOINTMENTS

Baltimore & Ohio Southwestern.—At the third annual meeting of the stockholders held at Cincinnati, O., Nov. 20, the following directors were elected: Edward R. Bacon, William L. Bull, Edgar T. Welles, Edward R. Bell, John H. Davis, William Mertens, Henry W. Poor, W. W. Peabody, Lowe Emerson, Fred H. Aims, Frank W. Tracey, Augustus B. Ewing, Alexander Shaw, James Sloan and Francis Pavy. The new Board elected the present officials for the ensuing year.

Bridgeport & Widmire.—The incorporators are H. G. Kennedy, Clearfield, Pa.; S. C. Walker, S. P. Harbison, William Walker and Hamilton Stewart, Allegheny, Pa.; and H. M. Kurtz, Clearfield.

Buffalo, Rochester & Pittsburgh.—At the annual meeting of the stockholders, held in New York on Nov. 16, the old Board of Directors was re-elected with the exception that Walter G. Oakman succeeded F. A. Brown, resigned.

Philadelphia & Reading.—The new Board of Directors met at Philadelphia Nov. 18, and elected these officers: First Vice-President, Theodore Voorhees; Treasurer, William A. Church; Comptroller, Daniel Jones, and General Solicitor, ex-Judge J. D. Campbell.

Pittsburgh.—At the annual meeting held in Richmond, Va., Nov. 16, the following officers and directors were elected: President, Warren G. Elliott; Vice President, H. Walters; Secretary and Treasurer, W. R. Jones: Directors, Dr. D. W. Lassiter, B. F. Newcomber, Henry Walters, Fred R. Scott, Waldox Newcomer. The directors elected J. R. Kenly General Manager; E. T. D. Myers, General Superintendent; W. A. Riarch, General Auditor; R. M. Sully, Superintendent.

Pittsburgh, Connellsville & Wheeling.—The directors of this new company are A. P. Funk, West Newton, Pa., President; H. A. Douglass, West Newton: Howard C. Bolton, New York, N. Y.; W. F. Vandeventer, Clinton, N. J.; Geo. B. McLane, Alexandria, Va.; R. L. Martin, Charles E. Garrard and Jonathan Barrett, Pittsburgh, and others.

Raleigh & Gaston.—At the annual meeting of the Raleigh & Augusta and Raleigh & Gaston companies, subsidiary lines of the Seaboard Air Line, Leigh R. Watts, of Portsmouth, was elected a director of both companies, in place of Charles D. Fisher, of Baltimore.

Richmond & Petersburg.—The following executive department has been appointed: J. R. Kenly, General Manager; E. T. D. Myers, General Superintendent; T. M. Emerson, Traffic Manager; H. M. Emerson, Assistant General Freight and Passenger Agent; W. A. Riarch, General Auditor.

Richmond, Fredericksburg & Potomac.—At the annual meeting of the stockholders in Richmond, Nov. 18, the following officers were elected: E. T. D. Myers, President. Directors on the part of the individual stockholders, Moncure Robinson, B. E. Newcomer, H. Walters, W. J. Leake, J. T. Ellison (State Director), reappointed. Examining Committee, J. R. Baylor, M. Robinson, Charles Ellin, L. B. Anderson and F. L. Scott.

RAILROAD CONSTRUCTION, Incorporations, Surveys, Etc.

Baton Rouge & Louisiana.—An election has been ordered for Jan. 28, in Alexandria and Ward, La., to determine whether a five-mile tax for 10 years shall be granted to aid building this road, which will extend from Baton Rouge, via Simmsport, Marksville and Alexandria, to the Texas state line, in Vernon Parish. The survey has been made from Baton Rouge to Simmsport, and active work will commence on that division next month. The road will connect at Simmsport with the St. Louis, Abyelles & Southwestern. The company agrees to have the line completed and in running order by January, 1898. The Council of Baton Rouge has ordered an election for the same tax in aid of the road, to take place on Dec. 28.

Bridgemont & Widmire.—The company was incorporated at Harrisburg, Nov. 21, to build a road extending from a point on the Clearfield & Mahoning road, at the village of Bridgeport, in Clearfield County, to a point at, or near, the town of Grampian, Clearfield County. The length of road is 2½ miles, all located in Clearfield County, Pa. The capital stock is $25,000, and H. A. Kennedy, Clearfield, Pa., is President.

Charleston, Clendennin & Sutton.—Governor William A. McCorkle, of West Virginia, who is interested in this enterprise with a number of Pittsburgh and New York gentlemen, announces that active work will be resumed again within a few weeks. The grading was discontinued about Aug. 1. The road is now completed and in operation from Charleston, W. Va., nearly to Clay Court House, up the Elk River Valley, and considerable work has been done toward Clay Court House, so that the line can be finished to that point in a few weeks. The road is to be continued to Sutton, connecting with the West Virginia & Pittsburgh, and will form a connecting link through undeveloped coal and timber lands in the state between the Baltimore & Ohio and Chesapeake & Ohio and Kanawha & Michigan.

Chicago & Calumet Terminal.—It is proposed to build a second main track between Blue Island and McCook, Ill., a distance of 13 miles, soon after Jan. 1.

Cleveland, Cincinnati, Chicago & St. Louis.—A change has been made on the main line on the Cincinnati Division, near Maplewood, O. The curve at that point, which is on a slight grade, has been straightened. A large three-span bridge was moved in the work of improvement.

Coast Railway of Nova Scotia.—This road is now completed for 14 miles and 16 miles more have been graded. Capital has all been secured and the road is being built by the Nova Scotia Development Co. The steel bridges will be built by the Central Bridge Co., Peterboro, Ont. All construction work is being pushed rapidly. The total length of the road will be 97 miles. S. H. Wheaton, of Yarmouth, N. S., is Chief Engineer.

Denver & Rio Grande.—A branch of this road is proposed from Granite, Col., to Mount Elbert, eight miles, to reach the gold and silver mines recently discovered at the latter place. All ore has now to be transported to Granite on the backs of burros or by wagon. An engineer of the company has been investigating this district, and his report has been submitted to the executive officers.

Kansas City, Osceola & Southern.—President Robinson, of the St. Louis & San Francisco, and Mr. James A. Blair, Vice-President of this company, who, with other members of his family owns the line, have recently been making an inspection trip of the road, and their journey has revived reports which have been long current that the road would be extended south to a connection with the St. Louis & San Francisco. This extension will be from Osceola to the present terminus of the road on the Osage River, which is to be crossed by a new bridge now about completed south to a point near Bolivar on the St. Louis & San Francisco, a distance of about 36 miles. Mr. Robinson and Mr. Blair made the journey overland between these two points. Mr. Blair stated later in a newspaper interview that the extension was under contemplation, but that nothing definite had yet been decided. The building of the line would give the St. Louis & San Francisco a Kansas City line, which it now lacks.

New Roads.—On Nov. 16 surveyors began at Metamoris, Pike County, Pa., locating a line for a road along the line of the Delaware River. It is not known in whose interest the work is being done, but local reports state that the plan is to run the line from the coalfields at Scranton, passing through Wayne County, through Greene township, in Pike, and then to Milford, by way of Coucktown, and thence up the valley to Metamoris, where the road will cross the Delaware River, and across the Erie road, where connection with the Port Jervis, Monticello & New York will be made.

Norfolk & Western.—The City Council of Norfolk, Va., has granted a petition from this company, to extend their tracks several miles along Water street and other streets in that city, which will be used principally for sidings, etc.

Northern Pacific.—It is reported that next spring this road will begin work on a line from East Grand Forks, Minn., following the river and crossing it at Drayton, tapping a wheat belt, the only outlet for which now is a line of boats operated by the Great Northern.

Ohio River.—This company has under way a number of notable improvements between Wheeling and Huntington. At numerous points old trestles are being filled in and several of the longer wooden bridges are being replaced with steel structures. Plans have been made for replacing many of the short trestles with stone arch bridges and fills in the spring. At Point Pleasant, the junction point with the Kanawha & Michigan, a substantial brick station has been completed. At Sistersville extensive improvements were put under way last week. A new freight station and storage warehouse, 100 ft. × 150 ft., has been begun. As soon as it is completed the old freight house will be torn down and upon its site a new granite passenger station and office building, 30 ft. × 100 ft., erected.

Pecos Valley.—One of the projects which have been revived in the last few weeks is the long-proposed extension of this road to a connection with the Atchison, Topeka & Santa Fe in the Panhandle of Texas, at Washburn. The extension would add about 200 miles to the existing line, which extends from Pecos City north to Roswell, N. Mex., about 150 miles. The extension would be north from Roswell. The line is now being operated by a receiver, but those interested in the property believe in the importance of the extension to the line, and are now endeavoring to complete financial arrangements to undertake the construction of the road. It is said that an issue of bonds to the amount of $2,000,000 is proposed to provide funds to build the line. The new road will go through a large area of cattle country and give the Pecos Valley, which has been made fertile through the large and expensive irrigation systems which have been built, an outlet on its northerly end. The extension would give the Atchison a direct and valuable connection into a portion of Texas from which it does not now get an important traffic.

Pennsylvania.—The headings of the new 2,100-ft. tunnel, at Radebaugh on the Pittsburgh Division, met Nov. 20. Drake, Stratton & Co., of New York, who have the contract for this important work, have had about 300 men employed since last January. James Day is General Superintendent and W. R. Michie, engineer in charge. The tunnel will accommodate two tracks and shorten as well as straighten the track and make an almost straight track from Greensburg to Grapeville. When completed it will be the longest tunnel in Western Pennsylvania. The masonry at the approaches, consisting of two abut-

ments at the Radebaugh end and an arch at the eastern end, the latter to be used as an under crossing for the township road, is about completed, and it is expected that the stone and brickwork of the tunnel proper will be commenced in about three months. The progress of the work has been somewhat retarded by the fact that the roof was very soft, necessitating the putting in of a great deal of timber for supports, but, in the main, the work has progressed satisfactorily.

Pittsburgh, Connellsville & Wheeling.—The company has been incorporated in Harrisburg, to build a road from a point on the Monongahela River, near the town of Millsboro, Washington County, Pa., following the course of Ten Mile Creek to the town of Clarksville, in the County of Greene, thence following the course of either North or South Ten Mile Creek to the town of Waynesburg, in the County of Greene, Pa. The length of the road will be about 15 miles. Alexander P. Funk, West Newton, Pa., is President.

St. Joseph Valley.—Work on the extension of the road from Berrien Springs to Benton Harbor, Mich., is being rapidly pushed in an effort to complete the grading before the winter. The material for the construction of the road is on the ground, and it is expected that the ties will be laid on the western section of the line early in December.

San Francisco & San Joaquin Valley.—The directors are reported to have about completed plans for making the proposed issue of bonds which are to be sold to provide funds for the extension of the line south of Fresno. The section now in operation between Stockton and Fresno, Cal., has been built from stock subscriptions, but the line south to the proposed terminus of Bakersfield, where a connection is made with the Atlantic & Pacific, will require an issue of bonds, and the directors are understood to have been assured of the success of the proposed issue. The section now to be built will be about 165 miles long.

Short Line (West Virginia).—Joseph Fuccy, contractor for building this line from New Martinsville to Clarksburg, W. Va., connecting the Ohio River Railroad and the Baltimore & Ohio, by way of the Fishing Creek and Bingamon Valleys, announced on Saturday last that work will be resumed within 10 days and pushed to completion as soon as possible. Contractor Fuccy had 200 men at work on the line during the spring and early summer till the closeness of the money market made a suspension necessary.

Electric Railroad Construction.

Bangor, Me.—The material has arrived for the construction of the part of the Bangor & Winterport road, and work was begun on Nov. 11. The track will be laid and operated as far as Sterns' mill in East Hampden within a few weeks, and the cars of the Bangor Street Railway Co. will be run over it through the winter.

Binghamton, N. Y.—At a special meeting of the Common Council, held Nov. 17, permission was given to the Binghamton Railroad Co. to double track Court street from Exchange street to the city limits.

Buffalo, N. Y.—At a meeting of the Supervisors, held Nov. 17, the Buffalo Traction Co. was granted permission to lay tracks in Franklin street, between Eagle and Church streets.

Camden, N. J.—A large force of men are at work completing the cross-town electric line on Second and Third streets, in Camden.

The work of extending the tracks of the Camden & Suburban Railway Co. along River road, from Stockton to North Cramer Hill, has been completed, and as soon as the wires are strung, cars will be put in operation. The residents at Beideman will have electric railroad facilities in the near future, if the railroad company do as they propose.

Charleston, S. C.—The Enterprise Electric Street Railway Co. have decided to make an important extension of its line on Broad, Meeting and East Bay streets, and President Passailaigue, of the company, states that the work will begin during the present month.

Work on the new electric railroad chartered two weeks ago by a company composed in part of New York capitalists, was begun last week, and Capt. J. W. Craig, who has been appointed to superintend the construction, says that it will be pushed vigorously and without intermission to a speedy completion.

Chicago.—The Chicago City Railway Co. has filed its petitions containing the consent of property owners and has made a formal application for a permit to place overhead electric wires in Indiana avenue, between Eighteenth and Thirty-ninth streets.

Fitchburg, Mass.—The Gardner, Westminster & Fitchburg Co. has been granted a franchise to build an electric road to extend from Fitchburg to Gardner through Westminster, referred to among our construction notes of Sept. 18.

Harrisburg, Pa.—According to a modification of the recent decree of the Supreme Court, the Harrisburg & Mechanicsburg Electric Railway Co. are permitted to construct their line under the bridge at Riverton.

Homestead, Pa.—The Homestead & Highlands electric line will be extended from Munhall to the Rankin bridge at once. The new extension will be over two miles long, and the estimated cost is $50,000. Cars will be run from Thirteenth street, Braddock, direct to Homestead.

Geneva, N. Y.—By another year it is expected to complete the projected Seneca County railroad from Geneva to South Waterloo. Rights of way are still being obtained.

Lebanon, Pa.—The Lebanon & Annville Street Railway Co. will build a new car-house 52 ft. wide and 188 ft. long. It will contain four tracks, and will have a capacity of 24 cars.

New York.—On Nov. 20 Commissioner of Public Works, C. H. T. Collis granted a permit to the Third Avenue Railroad Co. to extend its tracks from 167th street along King's Bridge road and Broadway to Spuyten Duyvil Creek. By the terms of the permit the Commissioner of Public Works has authority to supervise the entire work, to appoint engineers and surveyors, who shall be paid by the company, and to have the right to authorize the kind of poles that shall be used for stringing the wires. General Collis has designated that none but the groove rail shall be used. We are informed that work will begin within a week.

Patchogue, L. I.—Application for a franchise to build an electric road on North and Ocean avenues was made by the Cross Island Trolley Railroad Co., at a meeting of the Village Trustees, held Nov. 18. No decision was reached.

Philadelphia, Pa.—Press reports state that the Calhoun street bridge has been purchased by a syndicate headed by Col. Edward V. Morrell for $120,000, and that it will be used by the proposed electric road which is to run from Philadelphia to Trenton.

Pittsburgh, Pa.—According to press reports the Federal Street & Pleasant Valley Railway Co., and a company headed by Frederick Guniner, W. H. Keech and George B. Hill, are negotiating for the right of way over parts of the road along the proposed line to connect Pittsburgh with the towns along the Fort Wayne road.

The Consoldiated Traction Co. has put a force of men to work on the new line which is to be extended from Milvale to Bowerstown. Grant avenue, the principal thoroughfare, will be double-tracked.

Randolph, Mass.—The Randolph, Fall Brook & Nantasket Beach Street Railway Co. has been incorporated, with a capital stock of $13,800, to build a line 5½ miles in length.

San Francisco, Cal.—We are informed that the Market Street Railway Co. will begin work before long on the extension of the Mission Street electric line and that 1½ miles of double track will be laid south from Onondago avenue to reach San Mateo County. It is stated that the Mission Street line will be extended to the cemeteries in San Mateo County.

Toronto, Can.—The Metropolitan Street Railway Co. has been granted until May 31, 1897, in which to complete the line to Richmond Hill.

GENERAL RAILROAD NEWS

Atchison, Topeka & Santa Fe.—District Judge Meyers, at Oskaloosa, Kan., has appointed ex-Senator John Martin to be Receiver of the road in Kansas, vice Charles F. Johnson, who has refused to qualify. The attorneys for the road then applied to United States Judge Foster for an order restraining Martin from interfering with the operation and management of the property pending the hearing of the case in the Federal Court. The order was granted.

Atlantic & North Carolina.—As we go to press this week the stockholders of this road are in session at Morehead City, N. C., to vote upon the proposed lease to a newly-organized company, the "Goldsboro & Morehead City Railway Co." Much opposition has developed within the last two weeks, since the stockholders were enjoined from ratifying the lease at a former meeting.

Baltimore & Ohio.—The Receivers have been authorized by Judge Morris, of the United States Court, to give possession of the Strasburg & Harrisonburg Branch to the Southern Railway, which owns the property. The branch was leased by the Baltimore & Ohio Aug. 20, 1873, from the Washington City, Virginia Midland & Great Southern Railway. Proceedings were recently instituted by the Southern to recover the rental of $89,250 due for the year ended last September. In their answer to the suit, the Receivers recommended that the branch be surrendered, as it was not to the interest of the Baltimore & Ohio to continue the lease.

Earnings for October, 1896, compared with October, 1895, were as follows:

	1896.	1895.	Inc. or dec.
Lines E. of Ohio R.	$1,857,615	$1,708,620	I. $148,995
" W. " "	515,642	561,726	D. 46,084
Entire system	$2,373,257	$2,270,346	I. $102,911

Earnings and expenses for the four months of the fiscal year, compared with the same months of the last fiscal year, were:

Lines E. of Ohio R.	$7,152,461	$6,515,001	I. $637,460
" W. " "	2,000,382	2,073,146	D. 72,764
Entire system	$9,152,843	$8,588,147	I. $564,696

Boston, Revere Beach & Lynn.—General Manager Fenne makes the following statement of the uses of the proceeds of the $1,000,000 of new bonds authorized by the stockholders: "The new bonds are simply to provide for contingencies of the future, not for equiping the road with electricity. The electrical equipment of the road has never been officially considered by the directors, although it is conceded that electrical equipment is necessary, and it will probably be accomplished some time in the future. At present we have got all we can attend to in rebuilding part of the line. In July $350,000 bonds come due, and part of the new bonds will be used to retire these bonds. There is also about $300,000 of floating debt which becomes due about the same time, which will be taken care of by the new bonds. It was thought best to get authority to issue more bonds than immediately required in order to make full provision for the future."

Chicago & Northern Pacific.—Judge Jenkins, in the United States Court at Chicago, has entered an order confirming the master's sale of this property for $8,000,000, and has ordered a settlement of all claims against the Chicago, Harlem & Batavia Railway, which is part of the terminal system. The purchasers have placed in the charge of the court $350 per bond for the 194 bonds not represented by the Bondholders' Reorganization Committee each bond of the face value of $1,000 being given that cash value by the judicial sale. The United States Trust Company, of New York, was made the depository for all trust funds.

Cincinnati, Union City & Chicago.—The franchise and right of way of this road will be sold at Sheriff's sale at Bluffton, Ind., Dec. 5. The road was projected to extend from Huntington to Union City, Ind., but owing to financial difficulties, never was completed.

Jacksonville, Louisville & St. Louis.—A deed has been filed in the Federal Court, Springfield, Ill., transferring this road to the Jacksonville & Louisville Railway Co., the consideration being $250,000. The road was sold under foreclosure last July to R. E. Kennedy and J. H. Dunn, of Philadelphia, who now transfer the road to the new company. The Jacksonville & St. Louis Railway Co. has filed a first and second mortgage in favor of the Pennsylvania Co. for Insurance on Lives and Granting Annuities, of Philadelphia, Pa., for $650,000 and $1,650,000, payable Jan. 1, 1935, and bearing noncumulative interest at four per cent. per annum after providing for this interest upon the first consolidation five per cent. mortgage.

Louisville, New Albany & Chicago.—An agreement has been reached between the Olcott Reorganization Committee and the dissenting bondholders, the basis of which is that the rate of interest on the proposed new bonds is to be advanced to six per cent. in respect of $4,700,000, which are to be given bond for bond in exchange for the consols, thus securing to them the same rate of interest as at present. For arrearages of interest they will receive $37.50 per bond in cash at time of deposit and $50 in preferred stock when the certificates are retired,

Middle Tennessee & Alabama.—Upon application of the New York Trust Co., United States Judge Lurton has appointed Gaunt Crebe Receiver for this road, partly completed, from Shelbyville, Tenn., to Decatur, Ala. This step was taken in order to reorganize and complete the road. Joseph Dickson, of St. Louis, is now the President of the new company.

Monterey & Mexican Gulf.—The reports which were current some months ago that a lease of this line to the Mexican Central was in prospect are again published and the statement is issued with a good deal of detail as to alleged terms. We are able to state, however, that there is no foundation for these rumors. As a matter of fact, the question has never been considered by the Board of Directors of the Mexican Central, and presumably not by those of the Monterey & Mexican Gulf.

Ohio Southern.—The postponed sale, which was announced to take place on Saturday of this week, has again been postponed until Dec. 31, in order to admit of the required legal publication of the notice of the adjournment of the sale.

Ontario, Belmont & Northern.—This Canadian company, whose line extends to the Belmont iron mine, near Peterborough, Ont., has just been paid a bonus of $2,000 a mile by the Ontario government, granted at its last session. The Dominion government Engineer has also inspected the road, with the view to pass on its right to the $32,000 voted by Parliament.

Oregon Railroad & Navigation Co.—The reorganization of the Oregon Railway & Navigation Co., under the above title, has been completed, and the committee has announced the delivery of the new securities. Under the plan of reorganization the company is authorized to issue $24,500,000 four per cent. consolidated mortgage gold bonds, due 1946; $11,000,000 four per cent. preferred stock, and $24,000,000 common stock. Of the four per cent. consolidated bonds, there will be issued $15,174,000 for holders of consolidated bonds and collateral trust bonds of the old company. Of the remainder, $5,390,000 will be retained for the retirement of the outstanding $4,390,000 of five per cent. first mortgage bonds of the Oregon Railway & Navigation Co., $1,106,000 for betterments and terminals at the rate of not more than $250,000 per annum, and $2,830,000 for new construction at the rate of $20,000 per mile. The fixed charges of the new company will be about $925,000.

The $11,000,000 of preferred stock, with the exception of a small amount remaining in the hands of the new company, will be issued to holders of consolidated bonds and of collateral trust bonds of the old company and to stockholders of the old company who have paid the assessment, which stockholders will also receive new common stock, dollar for dollar, for their holdings. Both the preferred and common stock are put in trust under a voting trust agreement.

Philadelphia & Reading.—The railroad company's attorneys state that the Receivers of the railroad will transfer the property of the new corporation at midnight on Nov. 30. The Receivers, ex-Chief Justice Paxson, John Lowber Welsh and Jos. I. Harris, will be formally discharged by the United States Circuit Court, by whom they were appointed, early in December.

The rental of the Mine Hill & Schuylkill Haven road is to be reduced from $336,816 to $252,612, and that of the Chestnut Hill Railroad from $14,478 to $7,239. The Reading Company, in case of non-acquiescence, will not assume the properties.

Portland & Rumford Falls.—A mortgage of $1,000,000 has been recorded with the Register of Deeds, in Auburn, Me., to secure a new bond issue by this road.

Richmond, Nicholasville, Irvine & Beattyville.—The Supreme Court of the United States has just granted a writ of certiorari in the suit of the bondholders against the Louisville, New Albany & Chicago, to enforce the guarantee of that company to pay interest on these bonds. The decision, therefore, of the Circuit Court of Appeals in favor of the bondholders will be reviewed by the court at Washington, and the company's counsel intend to push the matter to a hearing before the final court, in order to have an adjudication upon the important principles involved, and because a favorable decision would simplify materially the procedure under the forclosure of the mortgage now in progress.

St. Joseph & Grand Island.—The foreclosure sale of the property will take place at Hastings, Neb., Dec. 23. The committee of bondholders will bid it in. The upset price as fixed by order of the court is $3,000,000, less by 1,000,000 than the price originally fixed. This line begins at St. Joseph on the State line, and extends through Kansas and Nebraska to Grand Island. This sale was ordered by Judge Sanford, of the United States District Court, in Nebraska, a year ago.

Scioto Valley & New England.—This road, commonly known as the Scioto Valley Division of the Norfolk & Western road, was sold at foreclosure to Joseph I. Doren, of Philadelphia, one of the largest stockholders in the Norfolk & Western. The price paid was $110,000, with the assumption of $5,000,000 mortgages to the Central Trust Company, of New York, and 600,000 of Columbus Terminal & Connection bonds, in favor of the Atlantic Trust Co. The road extends from Columbus, O., to Coal Grove on the Ohio River, a distance 131½ miles, and is the outlet of the Norfolk & Western to the northwest. The property has since been transferred to the new Norfolk & Western Co.

Seaboard & Roanoke.—The earnings for the three months ending Sept. 30 were published last week and make the following comparisons:

	1895.	1896.	Inc.
Gross earn.	$172,701	$217,690	$45,489
Oper. expen.	129,973	146,387	16,414
Net earn.	$42,228	$71,303	$29,075

The Seaboard Air Line system reports for the quarter ending Sept. 30:

	1895.	1896.	Changes.
Gross earn.	$730,754	$873,204	$152,450
Oper. expen.	586,593	625,605	39,012
Net earn.	$134,161	$247,599	$113,438

Wisconsin Central.—Judge Jenkins, of the United States Court, at Milwaukee, has extended for another year the $2,000,000 issue of Receivers' certificates authorized Nov. 15, 1894. The issue was due last week, and holders of certificates who are unwilling to extend the time of payment will receive the amounts of their holdings paid on presentation to Maitland, Coppell & Co., Edward Sweet & Co. or Brown Bros. & Co., New York City. The offer of the bankers named, to extend the certificate payments, was approved by the reorganization Committee at a meeting in New York, Nov. 5, the committee representing 75 per cent. of the first mortgage bondholders.